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It Must Advance

DURING the month of June we were so much occupied with our own convention matters that little attention could be devoted to the discussions which were engaging our American electrical confreres.

Some of the proceedings of the National Electric Light Association at Atlantic City were brief and to the point, and of practical value. They also demonstrated once again that there is very little difference in electrical development problems all the world over. Everywhere somebody is wanting electricity and can't get it!

It is characteristic of electricity supply that on both sides of the Atlantic, and in many other countries where British and American owners operate, the sale of electricity proceeds progressively almost indifferent to the existence of general depression. If this proves anything it is that electricity is always rendering an essential service; by its merit and efficiency it is showing beyond all question that it is a commodity which households new and old, and industries of all kinds, everywhere, *will* have and can fully afford to pay for. If advance is taking place while we are under a cloud, what should happen when skies are blue? One of the Atlantic City authors said: "Millions of our domestic customers can and will, in the future, use five or even ten times as much electricity as they now consume." Note the wonderful prospect!—what it means in new plant, new cables and wires, new installation work, new domestic apparatus, employment for larger staffs, and big profit for traders! Why should not we in Britain and throughout the Empire contemplate equally gratifying headway? There is abundant scope and we shall reap the harvest if we are ready when it ripens. Why be a pessimist?—leave that for the gas people!

Another of the American orators, not less hopeful than his fellows, qualifies his enthusiasm because he sees the need for electric supply men to employ every legitimate means of intelligently educating the public everywhere to a broader and better understanding of the value of a fuller service when obtained from properly-designed energy consuming devices. How can we most effectively awaken the public to the advantages of electricity in the American home? How familiar a question to English ears! And how familiar the answer! An electricity supply authority must fully recognise its responsibility for electrical service; it should hasten to give supply where needed; and there must be a thorough-going cordial understanding between all classes of those responsible for the sale of electrical appliances. Central station authorities must so prepare their sales programmes as to encourage and assist all other vendors of electrical devices. Team work between all—supply interests, manufacturers, contractors and dealers—is a vital need.

This second orator put in a word of gratitude to the electrical trade papers for influence within and outside the industry. The ELECTRICAL REVIEW blushes blue and hopes that this present article, though written in the holiday season, will put new interest and energy into those responsible for electrical development enterprise.

A third contribution that may be selected from our

transatlantic symposium is one urging thoroughgoing militancy on the part of electrical supply interests when attacked. It seems that, at the moment, United States electrical interests suffer, for reasons that need not be stated, from critics, agitators, politicians, and other mistaken people. The speaker, in this instance, with healthy candour, says that the political attacks—pretending that the American home is mulcted in very high electrical charges—have been a "rehash of old drivel and political buncombe." We have no reason to question the accuracy of this assertion, though we might have rendered it differently. The light and power industry looms up before its accusers there as a phantom Power Trust, and the speaker urged that industry not to remain silent, but openly to challenge, and answer, the attackers, and to defend the property of investors "against the muck-raker." Now, we too have our politicians and our critics. The politicians, however, for the moment are our friends—they like us much better than they used to do; the gas interests are among the critics—the prejudiced critics; but there are other critics too—mayhap we ourselves are among them; we want to see more movement among the dry bones of electrical development, for the summer is passing and the evenings are drawing in.

Why Cancel It?

OFFICIAL notification has reached us to the effect that the Council of the British Electrical and Allied Manufacturers' Association has decided not to hold its annual dinner this year. The present industrial and financial situation is responsible for this resolution. Now far be it from us to raise the least objection to the lessening of the number of evening functions of the kind during the coming autumn and winter. Economy is and should continue to be the order of the day, both in dinner expenditure and in speeches of a class, but we are not convinced that the manufacturers should set the example. The B.E.A.M.A. does much useful work quietly and behind the scenes, but is a time of industrial and financial difficulty one in which the electrical industry should seek obscurity? It is true that manufacturers will have their part to play in connection with the Faraday Centenary activities, but might not the B.E.A.M.A. dinner, with some good speeches by men of eminence, be the climax to the whole celebrations and afford an excellent opportunity for advertising the industry?

"Telling the World"

THE organisers of the Birmingham Section of the British Industries Fair are improving their world-wide publicity this time. Selected prospective buyers, about 100,000 in number, are to be steadily persuaded during the next few months that a visit to Birmingham in February will be well worth their while. The letters and pamphlets which they will receive will be personal in character, written in their own language, and even embellished with the flags of their respective countries linked up with the Union Jack. In the compilation of their lists of probable or possible visitors the organisers have the intimate local knowledge of our commercial diplomatic service at their disposal, so that their publicity is well directed. We trust that potential electrical buyers will be well represented in these lists, for the electrical section is now one of the most important divisions of the Castle Bromwich display.

Precept and Practice!

ELECTRICITY supply departments should temper their zeal with discretion when adopting propaganda slogans. We recently passed through one of London's suburbs where the street section boxes bore posters urging the residents to "Use Electricity for Everything." In amusing contrast to this useless general piece of advice which we don't believe converts a single soul or induces a consumer to add to his existing points, the same municipality carries its precept into practice by continuing to light the streets by means of gas! There are few better advertisements for electricity supply than brilliant outdoor electrical illumination. One of the earliest electrical slogans was "One arc lamp is worth two policemen!" It is as true now as then, with the added certainty that it quickly makes supply available for everybody en route. Councillors who approve gas for public lighting when they own and operate an electricity supply system, ought to be compelled to be deprived of all the benefits of electrical service in their homes—and even a gas man will regard that as a real hardship!

A Gas Attack

IN a speech at a luncheon held last week SIR DAVID MILNE-WATSON, president of the National Gas Council, in suggesting that main-line railway electrification was of doubtful economic value, based his prognostications on what he maintained had happened in the case of the national grid. He averred that the grid scheme would involve the expenditure of over £17,000,000 more than was originally estimated by the Weir Committee, owing largely to the addition of £8,000,000 to the cost of frequency standardisation. The next day the Central Electricity Board countered this by asserting that the expenditure on the grid was working out well within the Weir estimates. The extra cost of standardisation was due to the rapid increase in the use of electrical appliances since the estimate was made seven years ago. We can understand the gas industry's wish in this matter, but the thoughts which it fathers and its leaders express should be based on ascertained facts. As to the advantages of railway electrification, we have yet to hear the railway companies' views, which are anticipated to favour the general principle, but in conjunction with these the general effect on the country's efficiency has to be considered. Main-line electrification would lower the cost of electricity generally and thus enable it to be used for more and more purposes. This is fully realised by the gas industry, and is, for that industry, a sufficient argument against proceeding with main-line railway electrification.

Lord Weir Explains

IN a letter to *The Times* of July 31st, Lord Weir referred to Sir David Milne-Watson's speech and said that while it was not his duty to traverse the arguments of his "gas friends" in electrical or transport problems, he thought it useful to point out that his Committee's report nowhere expressed any opinion as to whether the railways of this country should be electrified or not. It was emphasised that the national, financial and possibly ultimate political considerations were not discussed, the Committee's aim being to make clear the essential economic factors. While this is absolutely true, after reading once again the Committee's "Summary and Conclusions," we cannot help feeling that it only just stopped short of recommending main-line electrification, for in that section of the report there is nothing put forward against the principle.

Sir Felix Also

WHILE we are dealing with the subject we think that the views of Sir Felix Pole as given to the *Daily Telegraph* last week should be placed on record. Sir Felix, who before he became the chairman of Associated Electrical Industries, Ltd., was manager of the Great Western Railway for eight or nine years, said that he had no doubt that eventually electric traction would supersede steam. There appeared to be no controversy as to the introduction of electric traction for suburban services, and in a small country like this a dual system would not continue indefinitely. The aggregate expenditure on electrification was large, but, viewed as an annual expenditure spread over a number of years, it was a different matter, and must be associated with the present annual expenditure on renewal of locomotives.

A Warning

THE police are on the look-out for a man who is posing sometimes as a telephone inspector and sometimes as an inspector in the employment of Callender's Cable and Construction Co., Ltd. The loss of valuables invariably accompanies his visits of "inspection," and readers should therefore be on their guard. He uses the name "J. Morris" among many others..

Berlin's New Power Station. By Chas. J. Webb, A.I.A.E.

A day-load station built for an ultimate capacity of 228,000 kW

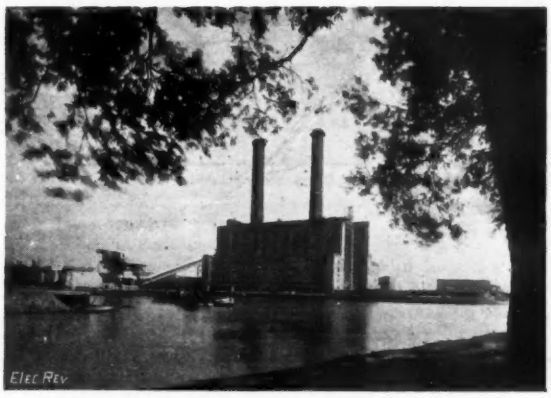
DESPITE the fact that the Klingenberg base-load generating station has only been in operation for about three years, the demand for electricity in the Berlin district is growing so rapidly that the Berliner Elektricitätswerke Gesellschaft ("Bewag") has for some time been engaged on the construction of another station on the bank of the River Spree between Siemens-stadt and Spandau. The load on the Berlin stations in 1923 was only about 142,000 kW, but it has since steadily increased until it amounted to 487,600 kW in 1929, while by next year (1932) it is expected that not less than 720,000 kW will be required, of which 260,000 kW will be furnished by old-established plants, 40,000 kW by the Charlottenburg steam-storage station, 180,000 kW by the Klingenberg station, 100,000 kW by transmission lines from distant plants, and 140,000 kW by the new (West) installation now being completed.

The location of the new station is in the west of the Berlin network, and the "Bewag" year-load diagram shows that it will only be necessary to have it in operation for about 1,500 hours per year; only during the winter months will its full capacity be required, only about half being necessary in the summer with little or no night load. Consequently, while efficiency has not been entirely overlooked, more attention has been devoted by the designers to installation cost.

The original scheme called for a useful output of about 200,000 kW peak load at a power factor of 0.9. Thus the problem resolved itself into which size of turbo-generator set would be the most reliable in long continued service, cost least, have good heat economy, and great flexibility in starting and closing down, having regard to the character of the station as a day peak-load carrier. The most favourable were 34,000-kW machines running at 3,000 r.p.m.

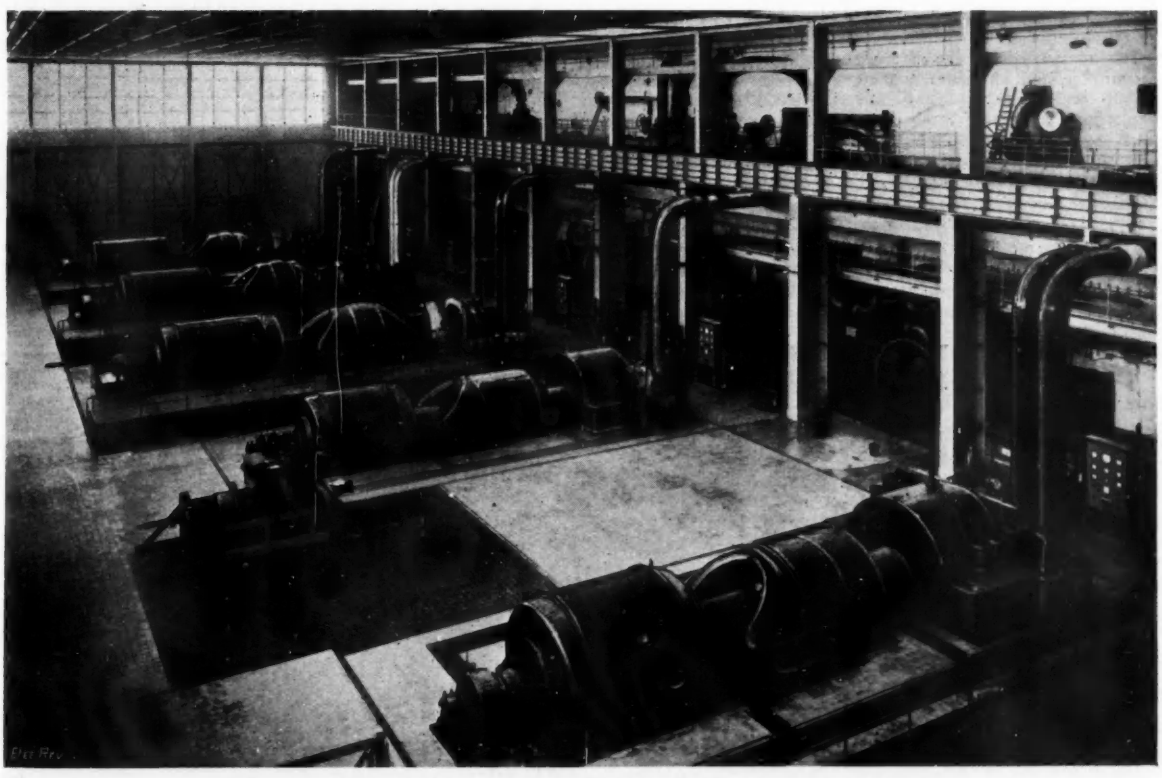
The buildings which have been erected are of sufficient size eventually to house not fewer that six turbo-generators of this size and two smaller sets of 12,000 kW for house-service purposes; the full capacity of the station will thus be 228,000 kW. The buildings cover an area of over 226,000 sq. ft., the greater part being of steel girder construction, faced with yellow bricks. With the 147-ft. high boiler house central, there are on the one side the coaling plant and station service installation, and on the other side are the pump and evaporator room, as well as the main turbo-generator room. Considerable thought was given to the lay-out of the plant, so that the different sections should follow one another in sequential order, *i.e.*, from coal to steam, from steam to electrical energy, and finally to the transforming plant.

Steam-raising considerations led to the selection of inclined-tube boilers of the Börsig type, for they ensure the easiest upward escape of the flue gases and the most favourable draught conditions; the form of the combustion chamber is favourable to grate firing; the humidity of the steam is low, since the mixture of steam and water overflows the tube-ends, which do not terminate in the water spaces of the drums; cleaning and replacing the tubes is easy. Their disadvantage, as compared with vertical-tube boilers, is the arrangement of the water feed and the drainage of the steam water from the cooling-pipe system of the combustion chamber.



Berlin's (West) Power Station

Eight boilers will be eventually installed, they being stated to be the largest so far used in any power station in Europe, having each a heating surface of 25,834 sq. ft. and a capacity of 120-150 tons of steam per hour at a pressure of 455 lb. per sq. in. and a temperature of 400 deg. C. The admission steam pressure to the turbines is 400 lb. The provision of a flue-gas pre-heater has been dispensed with, since the grate manufacturers considered a hot-air temperature up to 570 deg. F. permissible. The steam required for pre-heating the boiler-feed water is bled from an intermediate tapping of each of the house-service turbines. The boilers are stoker fired on the Taylor system, the fuel being fed to the com-



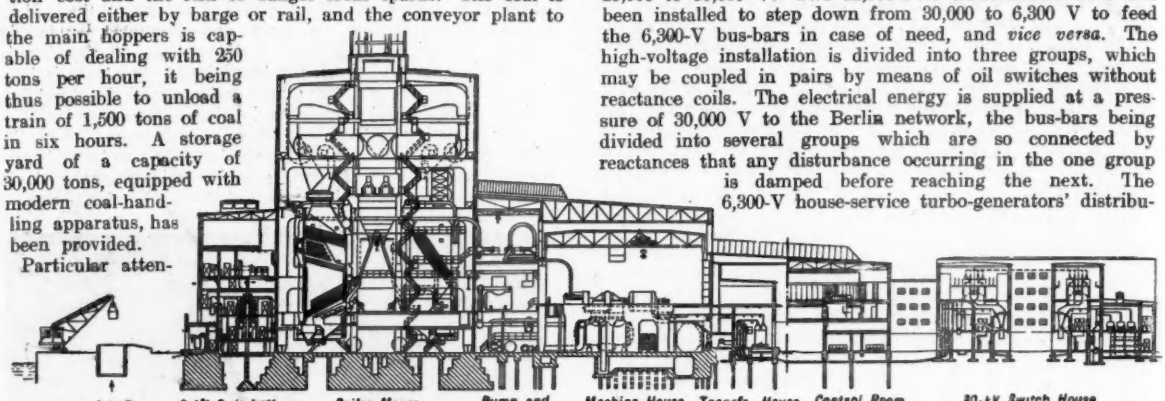
The Completed Portion of the Station, three 34,000-kW and two 12,000-kW Sets

D

bustion chamber intermittently by the action of reciprocating scrapers. The greater part of the heat of the flue gases is extracted for the purpose of pre-heating the combustion air.

The employment of pulverised fuel was not deemed advisable in this instance, both from the point of view of installation cost and the risk of danger from sparks. The coal is delivered either by barge or rail, and the conveyor plant to the main hoppers is capable of dealing with 250 tons per hour, it being thus possible to unload a train of 1,500 tons of coal in six hours. A storage yard of a capacity of 30,000 tons, equipped with modern coal-handling apparatus, has been provided.

Particular attention was paid to the avoidance of smoke and grit emission from the two chimneys of novel design, which are built up of steel girders filled in with hard-fired brick, and provided inside with a heat- and acid-resisting lining. The inside diameter of the chimneys is 20 ft. 8 in., and their height above the roof of the boiler-house, which is itself 150 ft. above the ground, is 210 ft., making a total height of 360 ft.



Cross-sectional View of the New Generating Plant

It should be noted that the "Bewag" Co.'s practice is to switch all main generating sets, as well as the incoming long-distance bulk, as a matter of principle in parallel directly on to the network and cover the internal requirements of its stations by machines which feed the auxiliary network exclusively. The practice frequently met with in some countries, particularly America, of coupling the main turbines to house-service generators has not found imitators in Germany; in view of the six-fold sub-division of the generating sets and very considerable load fluctuations, this arrangement was considered to be out of the question, since six generators of 3,000 kW each would have been necessary; they would have occupied more space and been more expensive than the two house turbines of about 12,000 kW each finally decided upon. Although strict economy as regards reserves was observed in other respects, it was nevertheless decided to install a spare 12,000-kW house-service set.

The main turbines are of the two-cylinder type; the high-pressure section comprises a 23-stage impulse wheel, while the second section is of the double-flux pattern, each of the two parts comprising three stages. Under normal condensation conditions the main turbines are designed to use 9.35 lb. of steam per kWh at half load, a minimum of 9.13 lb. at three-quarters load, and 9.68 lb. at full load. Each of the main turbines is provided with condensing plant having a cooling area of about 376,750 sq. ft.

The station auxiliary turbines are also of the two-cylinder type with coupled rotors. All the sets run at 3,000 r.p.m. The main alternators generate at 10,500 V and have an output of 37,800 kVA each at a power factor of 0.9; the two smaller sets each have a capacity of 15,000 kVA at 6,300 V. The alternators are provided with quick-acting regulators which limit the permanent short-circuit current to 1.2 of the normal.

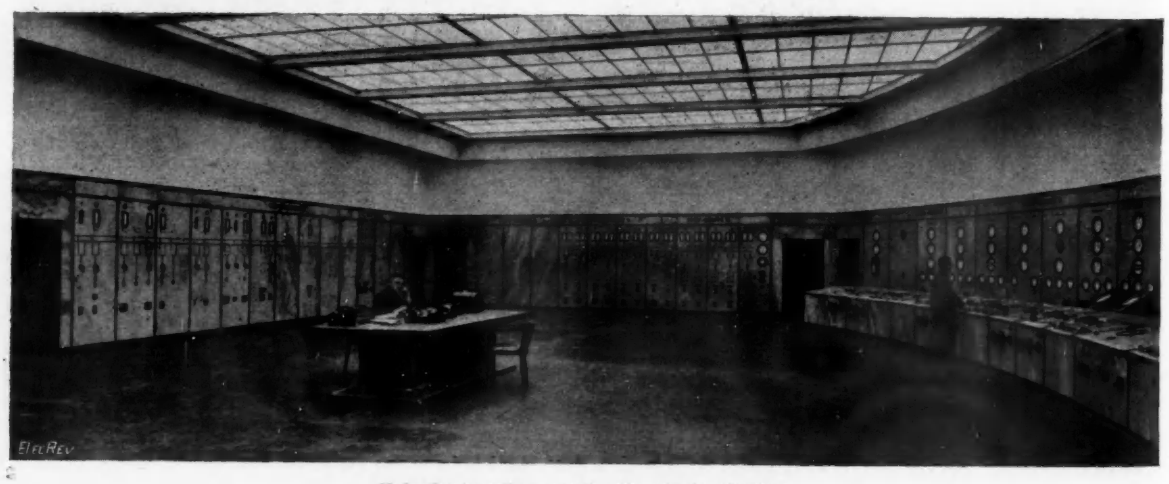
Each of the main generators is connected directly through the bus-bars to a 37,500-kVA transformer stepping up from 10,500 to 30,000 V. Two 12,500-kVA transformers have also been installed to step down from 30,000 to 6,300 V to feed the 6,300-V bus-bars in case of need, and *vice versa*. The high-voltage installation is divided into three groups, which may be coupled in pairs by means of oil switches without reactance coils. The electrical energy is supplied at a pressure of 30,000 V to the Berlin network, the bus-bars being divided into several groups which are so connected by reactances that any disturbance occurring in the one group is damped before reaching the next. The 6,300-V house-service turbo-generators' distribution system is connected through house transformers with the main bus-bars.

An attempt to unite the electrical and thermal controls at one place was given up, since the only possible situation for the control room, *i.e.*, within the boiler house, would have separated the latter into two parts, and the cable network would then have become very costly. It was therefore decided to locate the thermal control instrument panels in the immediate vicinity of their respective machines and boilers, and to arrange the electrical control room by itself between the transformer and turbine houses on the same level as the latter, since it was in any case essential to leave a passage-way at this point for the transformers.

Two covered bridges afford connection between the last two-mentioned sections, the lower level of the bridges being used for the passage of cables. The ground floor of the control building accommodates the two station 12,500-kVA transformers and such other equipment as accumulators, compressed-air plant for the operation of the oil switches and bus-bar sectionisers, and a CO_2 fire-extinguishing outfit.

Work on the new station was commenced in April, 1929, and the first stage of the plant, which will have an ultimate capacity of 228,000 kW, was completed in October of last year, when three 34,000-kW main and two 12,000-kW station auxiliary turbo-generator sets were put in operation, the necessary steam being supplied by four boilers. The station is being constructed and equipped, with the assistance of sub-contractors, by the Siemens-Schuckert Werke Gesellschaft, of Berlin, working in conjunction with the "Bewag" Co.

The cost of the plant is estimated at £13 13s. per installed kW, including the transformer station, and at £14 14s. without the latter, this figure including the whole of the equipment within the station enclosure, with the exception of the railway sidings. An idea of the compact grouping of the plant is afforded by the fact that an installed capacity of 11.72 kW has been secured for each square metre of building floor area, as against only 10.9 kW at the Klingenberg station.



Main Control Room at the New Berlin Station

Fabricated Work. By W. Sharp, A.M.I.Mech.E., A.M.I.E.E.

The possibilities of this class of work in skilled hands are unlimited

ONE of the most recent achievements in the world of engineering is fabricated design, and in the construction of machinery, electrical and mechanical, many of the components can be built up and welded together. Oxygen cutting has been employed commercially for more than a quarter of a century, but up to a few years ago (with the exception of a few simple machines) the process was almost entirely applied by means of hand cutting blowpipes. Even to-day the possibilities attached to flame cutting and welding are, in some cases, not fully realised, and consequently a few remarks upon the subject of fabrication may be advantageously presented.

The oxy-acetylene process had its inception in France in 1901, the principle being essentially the same as the oxy-hydrogen blowpipe. The temperature produced by oxy-hydrogen is about 5,000 deg. F., against 6,300 deg. F. obtained by oxy-acetylene. Not only is the flame of acetylene much hotter than hydrogen, but the number of B.th.u. per cubic foot is about five times as great, being as 330 to 1,600. Hence, both the intensity and amount of heat are greatly increased. The temperature produced by oxy-coal-gas is roughly 3,600 deg. F.

The oxygen supply for fixed machines is usually obtained from a number of cylinders, upwards of four being manifolded, and this system (fig. 1) is to be recommended. Two shut-off valves are provided on the main pipe, so that one half of the total number of cylinders can be isolated for reserve or recharging while the other half is in use. For fixed machines coal-gas can be used on material up to 8 inches

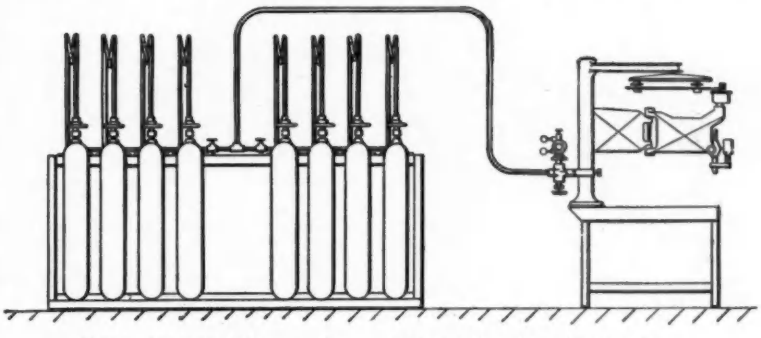


Fig. 1.—"Fixed" System of Oxygen Cylinders for Flame Cutting, &c.

Fig. 2.—Correctly Designed Fabricated Stator Frame

thick. The quantity of coal-gas, however, should not be less than 400 B.th.u. at 2 to 3 inches water pressure. With generated acetylene (portable sets excluded) it is usually inconvenient to have the generator alongside the machine, in which case the acetylene must be close at hand. With dissolved acetylene the cylinders may be manifolded in the same way as for oxygen, but near the machine, as it is undesirable to have long high-pressure pipe lines.

For complete portability oxygen and dissolved acetylene should be used, because the cylinders can be mounted on a wheeled truck. If, however, it is desired to use generated acetylene or coal-gas, the portability of the machine depends upon the accessibility of the generator or coal-gas main.

The speed of the torch or flame varies proportionately with the thickness of material, and also in accordance with the cutting medium. The tables in the next column give some typical cutting speeds and some relevant particulars, such as oxygen pressure, nozzle diameter, thickness of material, &c.

Although these figures may be taken as a general guide, it is hardly possible to give definite cutting speeds for every job. Several qualities of cut are obtainable—fine, medium, rough—and obviously the speed must vary according to the nature of the work. On ordinary mild steels, oxygen cutting has no detrimental effect providing it is a steel not adversely affected by the application of heat. This means that all steels containing carbon up to 0.45 per cent. can be quite easily cut and the surface readily machined after cutting. Above 0.45 per cent. carbon, surface hardening may cause inconvenience when machining; also, with material above 6 inches thick, there may be some chance of oxygen-cut surfaces developing cracks, and therefore it is recommended that carbon steels with more than 0.45 per cent. carbon content be preheated to about 500 deg. C. before cutting. Alloy steels, such as nickel, nickel-chrome, nickel-chrome-molybdenum, and similar materials, should be treated in the same way and for the same reasons. As is well known, manganese steel cannot be machined by the ordinary mechanical methods available to the engineer. Oxygen cutting has no detrimental effect on this steel, and perfectly smooth and accurate cuts are obtainable, with no hardening of the cut surface. Tests have been carried out to ascertain the effect of oxygen cutting on mild steel, and it has been shown that the ductility is not affected to any great extent, while the yield point and tensile strength are slightly increased. This is probably due to the slight toughening action of the cutting on the surface of the metal, the total increase in Brinell hardness being about 30 to 40 points.

Oxygen Pressure	Speed ft. per hr.	Nozzle dia.	Width of cut	Thickness material
OXY-COAL-GAS				
25 to 90	60 to 11	3/64 in. to 5/64 in.	¼ in. to ⅜ in.	¼ in. to 8 in.
OXY-ACETYLENE				
15 to 100	65 to 10	3/64 in. to 7/64 in.	¼ in. to 7/16 in.	¼ in. to 12 in.

The speed of oxygen machine cutting facilitates increased production in comparison with other methods, such as sawing, slotting, or shaping. This applies especially to large shapes which are often drilled out of plate, afterwards being smoothed up to the required size by slotting or milling. Locomotive side frames (fig. 3) are typical examples in which, from a cost point of view, great saving is effected, complete frames being produced in six hours against 30 hours using mechanical shaping methods. Although, of course, shape cutting for the production of articles from steel plate or forgings is the most obviously useful application of the process, it should not be forgotten that oxygen cutting can be just as profitably employed for almost any sort of steel cutting work. Two further examples are shown in figs. 4 and 5, where costs of produc-

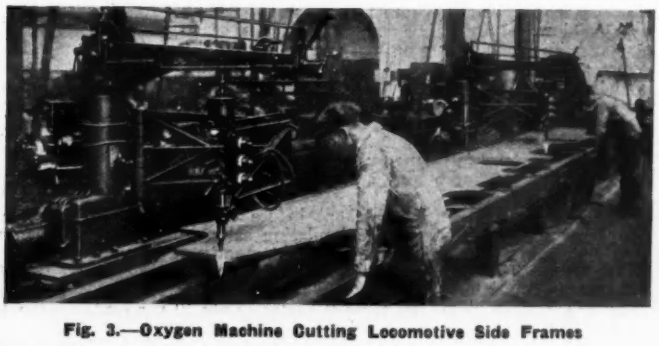


Fig. 3.—Oxygen Machine Cutting Locomotive Side Frames

tion are considerably reduced. Indeed, the time taken to produce the gear wheel (fig. 4) was seven minutes and the cost (excluding material) fourteen pence. The process of welding falls into two distinct classes, oxy-acetylene and the electric arc. For welding by the oxy-acetylene process the condition of the flame is, perhaps, the most important factor. An excess of acetylene gives carburised welds which are easy to make but are hard and brittle and less resistant to corrosion than the low carbon material. Lack of sufficient acetylene gives an oxydising flame and produces oxidised welds which are spongy and brittle. Ordinary soft-iron wire may be used for all general work where strength is of secondary importance.

Fig. 4.—Fabricated Gear Wheel

Repairs to steel and iron castings are made preferably by the oxy-acetylene process because of the heat distribution over a large area. The usual procedure after welding is to anneal the repaired article either in a sand box or a muffle of some description.

For concentrated heat, highly stressed and better class work, electric arc welding is recommended. This form of welding was first considered in this country in 1885, when a patent was taken out by a Russian named Bernados.

It should be made clear, however, that with the flame or the arc process the composition of the weld produced is largely determined by the skill of the welder. Electrodes for general application take the form of iron or steel core and a wrapping of asbestos twine coated with a suitable flux. Special electrodes, however, are obviously necessary for the welding together of the various metals. With stainless steel, for example, there are two types in general use—one a coated stainless steel and the other a mild steel rod covered with alloys in such proportion that the composition is similar to that of the material being welded. These are known as "synthetic" electrodes. In a paper recently published by the American Welding Society entitled "Major Provisions for an Arc Welding Specification," by F. P. McKibben, the following chemical composition of electrodes for arc welding is given :—

Carbon, 0.13 to 0.18 per cent.; mang., 0.4 to 0.6 per cent.; phos., 0.04 per cent. (max.); sulp., 0.04 per cent. (max.); silicon, 0.06 per cent. (max.).

With fabricated design the skill of the draughtsman is of premier importance. Indeed, it is now necessary for budding engineers to adapt themselves to structural work and to take a course in the art of cutting and welding. If the electrical industry is considered, little difficulty is found in the design of the various components, but to incorporate fabricated parts which give the required strength without undue weight is not an easy proposition in the first place. Special care and attention are required, and, incidentally, where patterns and castings have previously been considered, the switching over to fabricated design may, in some cases, lead to components being produced which are too heavy, and maybe, too weak. Fig. 2 gives an example of efficient design (a B.T.-H. stator frame) where the whole of the weight is supported by the feet and the main structures rest on the bedplate, being held apart by pieces of key steel. Shells for d.c. machinery are of simple construction—a plain barrel of steel with feet attached. Stator frames and magnet wheels for large low-speed machines, bearing brackets and intricate parts can be made of exceptionally thin material, providing good use is made of stout ribs and fillets. In the case of a.c. machinery the outside of the stator frame requires only to be a mere shell, since present-day designers favour an external covering of planished steel. With switchgear, too, there are innumerable jobs to which fabricated design is applicable. Finally, cutting machines have now long passed the experimental stage and may be definitely considered as reliable, quick and accurate shop tools. The majority of production cutting by these machines usually lies between ½ inch and 8 inches, but steel up to 18 inches thick has been quite successfully cut. Obviously, fabricated design has come to stay, and in the near future every efficient factory will have to be equipped for this class of work. The possible application of this method of construction, providing the welding is in the hands of a skilled artisan, is practically unlimited, and the question is becoming increasingly bound up with that of economics in engineering.

Fig. 5.—Oxygen Flame Cut Parts

Continuous Water Heating

Successful Development Scheme of a large Supply Company

IN an article by George S. Williams, vice-president and general manager of the Central Maine Power Co., in the *Electrical World*, some interesting particulars are given concerning the company's schemes for developing the water-heating load. The undertaking is operated almost entirely by hydro-electric plant, its customers being widely scattered through some 200 cities, towns and villages. In the fall of 1928 the Wyman development at Bingham was begun, to produce about 300,000,000 kWh per year, and the business in sight accounted for about two-thirds of that output. Steadily increasing demands for rate reduction were faced, and immediate steps had to be taken to increase the annual energy consumption per home, then only 336 kWh. Domestic water heating had an appeal as a load builder, and following preliminary tests it was decided to standardise on a 50-gal. copper boiler, properly insulated, with a split-circuit unit of 500 and 1,000 watts.

By January 1st, 1931, 620 water heaters had been sold, and this activity, with other sales efforts, raised the energy consumption per home to 438 kWh for the year 1930, the average use of energy by each water heater being 4,080 kWh per year. Low-wattage units were favoured as involving small chance of upsetting company policies as to peak-load demands and causing any heavy increase in capital investment. They are also simple to sell and install. It was desired to standardise a 1,500-W appliance in order to cut down wiring costs for the customer and the demand on the distribution transformers. A technically trained mechanical engineer with steam and hot water experience, is employed to direct the work under the commercial manager. It is his duty to inspect the piping in every home buying a heater, and to co-operate with the local plumber.

The subject was continually kept before the employés of the company, who received stimulating sales commissions. The undertaking sold 225 heaters in eight months of 1929 and 395 in 1930. These yield $5.10 per month per heater at the 1.5-cent energy rate. They were sold and installed for $150 cash and $165 on time. Of the 620 heaters, only 10 per cent. required 3,000 watts and 3.5 per cent. had to be connected in series to provide 100-gal. capacity. The customer requiring more than 50 gal. capacity on a 24-hour basis is exceptional. The average installation cost for wiring and piping was $28.26. Only minor adjustments have been required in the few service calls necessary.

The company is now proceeding on the basis of selling these water heaters installed for $199.50, which affords a fair profit to dealers and contractors and encourages their sales efforts. The residential cooking and heating rate in force prior to the water-heating development included an energy price of 3 cents per kWh for the first 30 hours' use of the demand per month, 2 cents for the next 60 hours' use, 1.5 for the next 210, and 1 cent above 300; minimum charge $2 per month for the first 7 kW of demand. An exclusive water-heating tariff of 1.5 cents per kWh was adopted, with a minimum charge of $4 per month, on a separate meter. It was surprising to see how many of the range customers were waiting for a water heater that could be operated at a reasonable cost. Seventy-five per cent. of the water-heater sales have been to range customers, many of whom have earned a 2-cent or a 1.5-cent rate by their total usage under the residential heating and cooking tariff.

Recently the undertaking surveyed the operation of 60 heaters with 90 kW connected load over a week-end. On Saturday noon their peak was 50 kW. A gradual decline followed to a minimum in the night of 10 kW, increasing to a Sunday noon peak of 40 kW. Monday is washday in Maine, and between 10 a.m. and 1 p.m. the heaters reached 54 kW peak, dropping gradually to 10 kW during the night. Water heaters help to fill the noon valley as well as to improve the system load factor. Tests show a diversity factor of 1.6 for these water heaters, from 55 to 60 per cent. load factor for 24 hours, and an annual energy consumption of about 4,000 kWh per heater.

If the company sold 5,000 water heaters based on a diversity factor of about 1.6 and averaging, say, 900 watts per heater, the load would be 4,500 kW.

Engineering Mathematics. By G. W. Stubbings, B.Sc., F.Inst.P., A.M.I.E.E

A brief discussion of the importance of mathematics in the educational training of an engineer

THE degree of prominence which mathematics should occupy in the educational training of an engineer is a question which is supposed to have been settled many years ago. The orthodox view of this matter took shape largely owing to the efforts of such educationists as Perry and Silvanus Thompson, who did so much to popularise the study of mathematics. Those men were successful in breaking down the barrier which formerly existed between what were called the elementary and the higher branches of this subject. The rigidity of the barrier can hardly be appreciated now by those who have studied mathematics under the present system, which is due, in so large a measure, to those pioneers. Its effect was rigorously to exclude the methods of the calculus for the solution of any problem deemed to fall within the scope of elementary mathematics, and to substitute for a simple and straightforward differentiation or integration an ingenious and roundabout calculation, the understanding of which often required a good deal more intellectual capacity than would have been required for a grasp of the elements of the calculus. It was mathematical processes of this kind that Thompson used to describe, in his characteristic way, as "calculus dodging." The once celebrated works on the "Calculus for Engineers," by Perry, and on the "Calculus Made Easy," by Silvanus Thompson, although obsolete as text books, can still be read with pleasure and profit. In both of these books the authors treat with playful ridicule the once-prevailing view that the study of the calculus was one to be approached with awe and reverence, and only after a long and arduous apprenticeship in the elementary branches of mathematics.

The teachings of Perry and Thompson, which virtually insisted on the necessity of a knowledge of the elements of the calculus by every properly trained engineer, have been generally accepted for so many years that an independent observer might well infer that, excepting in the case of elderly men whose training was necessarily deficient owing to the unsettled state of electrical technology when they received their education, the average engineer would possess a good working knowledge of text-book mathematics. If the accuracy of this inference be tested by actual observation, it will be found that, with regard to mathematical knowledge, electrical engineers can be divided into two fairly well defined classes; the one comprising those engaged in teaching or in design or research work, and the other those engaged in such fields as commercial, contracting, or operating. The engineers comprised within the first of these two classes will naturally have the kind of mathematical knowledge which is expected as being the normal equipment of an engineer. With those engineers in the second class it will be found, with relatively few exceptions, that, if their mathematical knowledge ever reached the standard which would, on the orthodox view, be regarded as normal, the bulk of that knowledge has been forgotten.

The Use of the Calculus

It is quite a common experience to meet with thoroughly able engineers, with an excellent grasp of theory which they can readily apply to practical problems, who are quite apologetic about the fact that they have forgotten their calculus. When reading technical articles or institution papers they will skip over any portion which contains a mathematical investigation, so that writers of papers of any length usually put as much of their mathematics as they can into appendices, which can be skipped without interrupting the sequence of the reading of the body of the paper. To such men, the highest recommendation a reviewer can bestow on a new book is that it is non-mathematical. The indisputable fact that so many engineers, who in the days of their educational training learnt the calculus, forget it so quickly when they engage in the practice of their profession is worthy of serious thought. An engineer who has forgotten a branch of mathematics which is supposed to be an essential part of his intellectual equipment does not forget how to use a slide rule, or to manipulate an algebraic formula. He can read a complicated drawing, interpret a graph, and readily understand a simple vector diagram, but a sign of integration is taken as a signal to skip in his reading of any technical literature.

There is little doubt that the movement which resulted in popularising the calculus has had the effect of inducing, in writers of a certain class, a tendency to use the calculus notation unnecessarily, as an end rather than a means. Consider, for instance, the elementary calculation in alternating-current theory for finding the r.m.s. value of a sinusoidal alternating voltage. In a mathematical text book it is legitimate and proper to treat this problem as an example in elementary integration and the finding of average values. There is, however, no justification for doing this in a text book on electrical theory, since the required result can be obtained without the use of the caclulus notation, merely by an application of the axiomatic principle that the average value of a sine function over any number of complete periods is zero. Consider also the derived functions of a harmonically varying quantity. These can be deduced with the greatest ease from the kinematical properties of simple harmonic motion. Moreover, the average value of a sine function over half a period can be obtained by a simple geometrical method.

Alternating-current Theory

A knowledge of the r.m.s. and average values of a sine function, together with a knowledge of its derived functions, will be as serviceable as an acquaintance with the conventional text-book course on the calculus, for all the alternating-current theory required by the average engineer. Alternating-current theory was regarded as prominently a branch of electrical technology which required for its proper understanding a sound knowledge of the calculus. Although the elements of such theory were only reduced to the existing stage of simplification by the ingenuity of mathematicians, and by the use of the methods of the calculus, it is useless to urge that, now the simplification has been effected, its advantages are to be thrown away by insisting upon the use of mathematical methods of unnecessary complexity. The fact that a good working grasp of a.c. theory, sufficient for the majority of engineers, can be obtained without the use of the calculus certainly suggests that the importance of this study in the mathematical training of engineers can be overstressed, and it also suggests that the reason why so many engineers who, having learned the calculus, proceed to forget it is that this branch of mathematics is of very little use to them in the actual practice of their profession, and that, apart from its possible cultural value, the time devoted to its study has been more or less wasted.

Forgotten Knowledge

The dislike of the engineer for mathematical symbolism is unmistakeable, and, in view of the importance given to the subject in his educational training, somewhat difficult to understand. It may be due to the fact that the practical work of all electrical engineers, with the exception of those engaged in the spheres of teaching, design, or research work, does not increase familiarity with the methods of mathematical technology which they may have acquired in the days of their educational training. A complicated drawing which will be read with ease by a practical engineer may be well nigh unintelligible to another man who has had a similar education, but who has drifted into becoming a specialist teacher of pure mathematics. The engineer forgets his calculus, not because he is unfitted intellectually to retain the knowledge, but for the same reason that an engineering student who found that he had mistaken his vocation, and who became an accountant, might forget how to use a slide rule. The knowledge is forgotten because it has never been practically used. There are, of course, in all branches of engineering, men who have a real taste for mathematics, and who not only retain what they learnt at the technical college, but who, by reason of their liking for the subject, improve their knowledge as times goes on. These men are, however, the exceptions, and, with the majority of engineers engaged in the commercial or operating fields, the mathematical technique which they laboriously acquired in their young days is rapidly lost when they pass from the atmosphere of the technical college to that of the works or the office. We have said mathematical technique advisedly, because it is possible, or even common, for an engineer to have a correct mathematical instinct towards the practical problems which he encounters whilst having a dislike for mathematical symbolism and a lack of aptitude in mathematical technology. It may, of course, be urged that correctness of mathematical instinct is the result of a system of education which has included more mathematical technology than would be required for actual practical application. It is, of course, difficult to rebut such a contention, but actual observation does not tend to show that those engineers who have forgotten the most are foremost in possessing that peculiar intuition which is one of the most characteristic features of the engineer, the mental basis of which seems to be largely a kind of mathematical instinct.

The distinction between mathematics as a science and mathematical technology is pointed out by Prof. Whitehead in his interesting little "Introduction to Mathematics." In this book it is remarked how, in the teaching of the subject, the scientific aspect is obscured by an insistence on technical procedure. This point will be clear to those who are acquainted with Chrystal's "Introduction to Algebra" and have compared it with such standard treatises as those of Todhunter and Hall and Stevens. Chrystal's book can be read with pleasure; the same cannot be said of works on algebra of the ordinary kind.

Means to an End

The insistence on technique in the study of algebra prevents the average student from obtaining a notion of the principles of algebraic form, and the closely connected principle of dimensions as applied to physical formulæ. It seems often to be forgotten by writers on engineering subjects that mathematical symbolism is a means to an end, and that, rather than there being any merit in the use of symbolic notation, it should be employed as little as possible. An able writer is often competent to present a proof of a theorem in applied mathematics in a quasi-verbal manner, and it seems certain that verbal arguments appeal more to the engineer than those in which excessive use is made of mathematical symbolism. Contrast, for instance, the laborious proof that the r.m.s. value of sin x is $1/\sqrt{2}$, using the notation of the integral calculus as given in the majority of text books, with the concise proof found in "Electrical Measuring Instruments," by Drysdale and Jolley, in which the required result is obtained as a simple deduction from the theorem of Pythagoras, using the minimum of mathematical symbols. As an example of what may be done in the presentment of a subject, inherently mathematical, with very little mathematical symbolism, Thomson and Tait's work on the "Elements of Natural Philosophy" may be cited. The first 51 pages of this work deal with kinematics, and the subject is treated in a masterly way, using, in the aggregate, not more than a few lines of mathematical symbolism. To those with a taste for the technique of mathematics, the method adopted by the authors of this book may be more difficult to follow than the conventional treatment found in the usual books on applied mathematics. It is, however, more than possible that the verbal method will be more acceptable to those to whom mathematical symbolism is more of a hindrance than a help.

It is submitted that, in view of the foregoing arguments, the conventional mathematical training for engineers, as exemplified in the conventional text books, is, excepting for those engaging in certain restricted fields, largely a waste of time, due to the predominance of the technical aspect. If we consider the amount of mathematical technique required by the majority of engineers, we find that the amount can be reduced to very modest dimensions. An ability to perform arithmetical calculations rapidly and accurately, some ability in mental arithmetic, familiarity with the transformation of simple algebraic and trigonometrical expressions, ability to interpret graphs, and the knowledge of elementary geometry which, strangely enough, seems almost intuitive with most engineers—these seem to constitute a technical equipment which suffices for the work of the practical engineer. It will be interesting to give Prof. Whitehead's views as to the best procedure for those who wish to study mathematics as a science, and on account of its cultural value. The suggested course commences with the elements of geometry and algebra, both being treated very briefly to give only the necessary ideas, the study of algebra being mainly graphical. Next in order come the elements of trigonometry and co-ordinate geometry. After this the student is recommended to proceed to the study of the calculus. It is here interesting to note that Prof. Whitehead attaches considerable importance to the study of analytical geometry, a subject which assumes very little importance in the conventional mathematical courses for engineers. With regard to the technical side of mathematics, it is suggested that, for those who possess a real aptitude for the subject and who are likely to benefit by a serious study, more attention should be given to the tracing of graphs from their equations, to the finding of functions to fit experimental results, and to the obtaining of approximations to complicated expressions.

Engineer's Tool

It has been often said that mathematics should be the tool of the engineer. While this is true in part, the mistake can be made of equipping him with more tools of this kind than he will actually require. A modification of the conventional methods of teaching mathematics to engineers might have two very important results. In the first place less insistence on the mere acquisition of technique would give time for the study of other subjects, such as economics, history, and mercantile law, which are not only indirectly useful to the engineer, but which also have a real cultural value. In the second place the study of mathematics from the scientific, rather than from the technical, point of view might well tend to initiate a liking for a subject which, presented in the right way, is full of interest, but which, from the purely technical side, is often mere drudgery.

Field Failure of Alternators in Parallel

There is no danger in reclosing the field switch below three-quarters load

THE usual practice in the event of the failure of the excitation of an alternator when running in parallel is to switch out, re-excite it, and then re-synchronise. An investigation into the behaviour of large units in such circumstances is reported in *Power*.

Replies from ten operating companies and one manufacturer brought information about sixteen cases in which field switches were reclosed without cutting the generator off the bus. No one reported any disturbance on the reclosing of the field. Seven companies stated that they had promptly reclosed the field switch, or would not object to its being done, and three would switch out the alternator. The manufacturer recommended the closing of the field switch.

Tests were made on the restoration of the excitation of alternators of 30,000-kW and 60,000-kW capacity. The first unit was rated at 35,000 kVA, 85 per cent. power factor, 12,000 volts, 1,200 r.p.m., 60 cycles, driven by a tandem-compound turbine. The field switch was opened when supplying a 15,000-kW 72 per cent. power-factor load, and was left open for approximately 1¼ minutes. There was no violent fluctuation of current or voltage while the switch was open.

A second test with the same set-up of values resulted in the same conditions. This was followed with a test when the unit was loaded to 21,000 kW. Results were about the same, except that the bus-bar voltage dipped to 11,000.

The 60,000-kW unit comprised a 17,000-kW 1,800-r.p.m. generator driven by a high-pressure turbine and a 43,000-kW 1,200-r.p.m. generator driven by a low-pressure turbine with a reheat boiler between the high- and low-pressure turbines. During two premilinary tests the unit was given a load of 20,000 kW at 85 per cent. power factor. The switch was opened, which cut off the excitation of both fields. The switch was left open for approximately three minutes, during which time the hand of the synchroscope made 16 revolutions, showing that the field of at least the high-pressure generator was slipping ahead of the system slowly. The speed of the high-pressure unit was compared with the system by means of the synchroscope, which was connected between the house alternator on the high-pressure unit's shaft and the 2,300-volt bus, which was alive from the main 12,000-volt bus.

Reclosing the field switch occurred about the time the synchroscope showed the high-pressure rotor to be 180 deg. out of phase. That is, the mechanical time-phase relation of the poles of the rotor was 180 deg. away from the normal position. There was a total absence of surging or violent fluctuations; the excess current on both generators simply subsided, the synchroscope needle stopped at the in-phase position and the voltage came to normal.

A second set of tests was made with the 60,000-kW unit, during which oscillograph records were made. The field switch was opened three times in all. On the first test the machine had 30,000-kW load at unity power factor. On the second test the machine had the same load, 30,000 kW, at unity power factor, but the field switch was kept open over 30 seconds. On the third test the machine had 50,000 kW at 80 per cent. power factor when the switch was opened. The general performance of the machine in each test was similar, but the amplitude of the current and voltage oscillations was much greater for the higher load.

The conclusions are drawn that different types of generators behave in different ways when the excitation is cut off. Old units having low-resistance field windings and operating with 125-volt excitation are more erratic than later machines employing 250-volt excitation, probably due to lower energy losses in the rotors. If the unit is carrying less than three-quarters load there is no danger in reclosing the field switch. If the unit is carrying more than three-quarters load it will be prudent to lower on the governor before reclosing the field switch.

If the bus voltage has dropped to 60 per cent. of the normal it will be prudent to open the generator switch to prevent other generators dropping out of step.

Owing to its reactance, it is impossible for the rotor field to jump up to full strength and, correspondingly, owing to a weaker magnetic coupling, it is impossible for the rotor to change speed instantly; therefore, there can be no shock such as is experienced when paralleling a machine out of phase.

Small-motor Manufacture

Features noted when visiting a modern factory

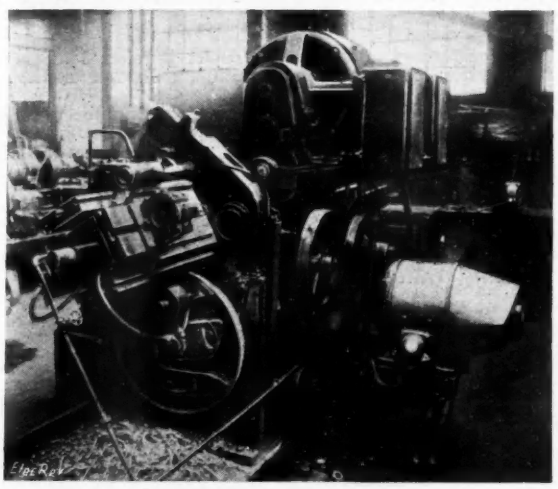
THE magnitude of the advance in methods of production since the beginning of the century is brought home to an engineer by a tour through a modern works, and noting the difference in the machine tools employed nowadays and those available when he served his time.

In a recent visit to the Acton Lane works of the Crypto Electrical Co., Ltd., one of the things that most impressed us was the way in which the electric motors produced there appeared to make themselves, with a little human help, rather than to be fashioned throughout by human agency, so smoothly is the manufacture carried out in continuous sequence right from the delivery shed, where the spindles are sawn into the requisite lengths, to the bay whence they are sent out to various parts of the world.

An Aisle of the Main Machine Shop

The shafts are first rough-turned (there are six stepped diameters on each) to micrometer gauge in the main shop (a building about 280 ft. long by 60 ft. wide), where the other component parts are also machined preparatory to assembly. The latter include the fluted end plates for totally enclosed motors (these fittings reduce the heat losses by 9 or 10 per cent.) which are bored and faced on eight lathes.

High-speed tool steel is used throughout the works. Automatic turret lathes for parting off, boring, and facing the ball-bearing caps are very much in evidence. One of the Gridley type,



A Multi-duty Automatic Lathe

driven by a 7-b.h.p. motor, with a 3-b.h.p. motor automatically brought into play to change the operation, is illustrated on this page. The motor frames are all drilled to jig the whole of the 18 holes in each at one time; they are then screwed by a three-fold tapping machine. The feet of eight motors are planed together. The frames of the a.c. motors are made of cast-iron, but for the d.c. machines cast-steel is used exclusively on account of its much higher magnetic permeability, which reduces the amount of copper in the field coils and also the sizes of the yokes.

It is the claim of the company that all parts of every motor of the same output and type are absolutely interchangeable. We tried a few at random and found this to be the case.

A labour-saving device is the trolley with six vertical spindles, shown in the foreground of the view of the bay in the main machine shop. On this trolley the castings are wheeled to the machines, one spindle being left spare to receive the earliest of the finished articles. After completion of one process the entire set is then wheeled on for the next. Stampings are brought from an outside source and, in the case of the larger motors, are ground to ensure an even air gap; those for the smaller machines are bored.

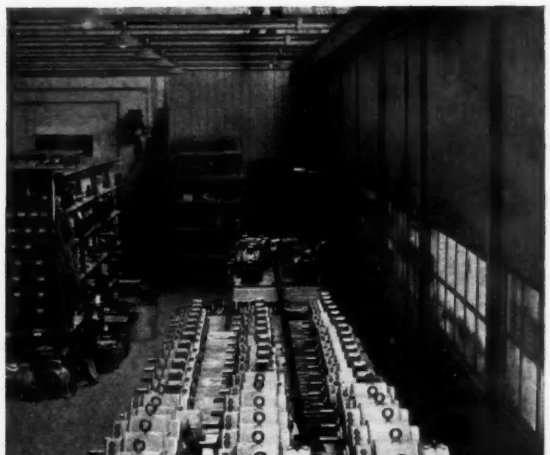
The rotor bars are welded to the short-circuiting rings by an oxygen and coal-gas flame. For electric welding direct current is supplied from a 27- to 150-V, 50- to 200-A motor-generator. The d.c. machines are wound by men, and the a.c. machines by girls, all engaged on piece work. The rotors are tested for short-circuit by placing them in a stator on each bench of the particular size being wound there, when any fault is indicated by transformer action.

Each completed machine is placed on a trolley and run into a lift which is lowered on to a run-way consisting of closely spaced rollers running on ball bearings. Without any further handling the motor travels to the impregnating department—a distance of 300 ft., which includes two right-angle bends; the average gradient is about one in ten. In view of recent correspondence in the ELECTRICAL REVIEW it is worth noting that the company's engineers are strong believers in vacuum-pressure impregnation of the windings. Since this system was adopted, several years ago, no winding failures have been experienced.

As the motors are received from the winding department they are placed for 12 hours in an oven, in which a temperature of 200 deg. F. is maintained by means of steam coils, assisted by electric heating through the medium of carbon resistances. After this drying-out process the motors are dumped, 30 to 40 together, into two vacuum retorts. After half an hour's treatment the process is reversed and pressure impregnation begins. On removal the machines are cleaned with benzole. The machines are then placed on another run-way which conveys them to the dispatch bay, to be seen in the illustration of the motors manufactured for use in Athens. The output of the works is about 40 motors per day. These range from 100 to 500 volts and in capacity from ½ b.h.p. single-phase or 1 b.h.p. three-phase to 20 b.h.p. Motors up to 30 b.h.p. can be built at Acton if necessary, but normally motors of above 20 b.h.p. are made by the associated company, the Lancashire Dynamo and Motor Co., Ltd.

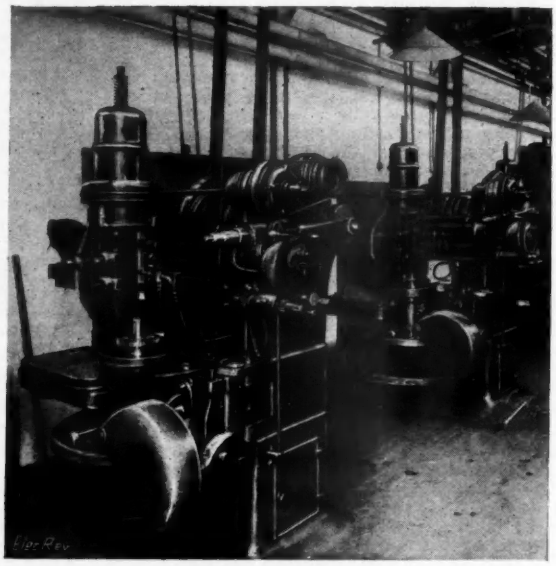
The Crypto Electrical Co. has been engaged in the motor-manufacturing business since 1904, and now employs something like 360 persons. Its activities are not confined to the one sphere, and its directorate is always on the look out for new fields for exploitation. Any account of the works would be incomplete without a reference to the "Langham" department, where gearing for a very wide range of speed reductions is manufactured. The close limits of the work are certainly striking. We inspected with great interest the new rotary convertor—the "Cryptoverter"—for "all-mains" a.c. radio receiver sets, the particular feature of which is its level-compounding characteristic. We also had aural evidence of the satisfactory elimination of a.c. ripple, and the absence of any direct radiation from the convertor itself.

A Bay in the "Langham Works"



Some of the 800 Motors for Athens

Another interesting device manufactured at the Acton works and which we were shown during our inspection, is a commutating rectifier for charging batteries and supplying current to cinema arcs. This consists of a self-starting synchronous motor fitted with an external commutator for a.c. rectification; the motor is driven by a.c., which supplies also the primary winding of a static transformer. The low-voltage secondary current is converted to uni-directional current by the commutator, which is coupled to the motor shaft. For further particulars the reader is referred to the "New Devices Column" of the ELECTRICAL REVIEW of July 3rd, 1931, p. 19.



Gear-cutting Machines

Our thanks are due to Mr. J. G. Shaw, managing director of the Crypto Electrical Co., for facilities afforded us to view the works and take the photographs which are reproduced with this article.

Lining-off Centres

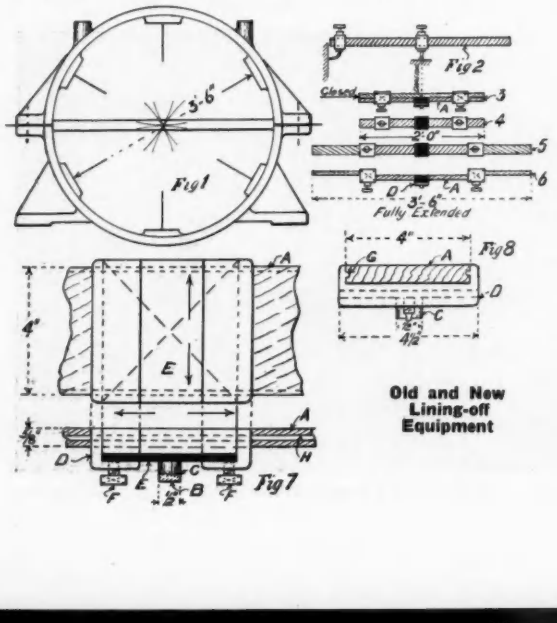
An easily-adjustable method of finding machinery centres

BY "lining-off centres" are traditionally meant the strips of wood with pieces of tin tacked on them which are used to fit across the details, such as the yokes of motors and generators, as a means of finding their centres for machining pole-faces, &c.

Fig. 1 shows a split yoke with a piece of wood fitted in and a piece of tin tacked on, the centre being found by means of the odd-legged trammels shown in fig. 2.

This plan, though quite common, is not to be recommended when many lengths of wood are needed to fit the many sizes. It converts the benches of a machine shop into an untidy miniature timber yard; moreover, centre-marking the tin with a "dot" punch does not give a precise result, as it often causes the wood to shift and the work to be undependable.

The easily adjustable lining-off centres described have proved very serviceable, not only as time savers, but also because one set will apply to many diameters, and the centre dot, being permanent, just needs shifting in a universal slide to bring it to the necessary centre, as found by the trammel. The device shown in the adjoining sketch is 2 ft. long, when closed, and 3 ft. 6 in. long when extended, the section of the double width of the wood being 4 in. wide by 1¼ in. thick.



Old and New Lining-off Equipment

The two parts are opened out to the necessary length and fixed, as nearly as can easily be judged, across the centre of the yoke; the device is then wedged tightly in after being gripped by the clips and screws shown.

The centre clip carries a double sliding device with a move able brass plate carrying a permanent centre-dot on its handle. To place this centre-dot where needed (as decided by the trammel) the double slide is available for moving it either horizontally or vertically (the clip along the wood strip, and the handle with the centre in a vertical direction).

Figs. 3 and 4 show the device closed and figs. 5 and 6 show it fully extended. The double slide is roughly shown in these sketches. Fig. 7 shows the double slide on a larger scale; A, also shown in figs. 3 and 5, is the wood strip 2 ft. long. B in figs 7 and 8 is a permanent centre in the pin C.

It will be seen that by means of the slide D all horizontal adjustments and all necessary vertical adjustments may be easily made with the aid of the brass-plate slide E.

The permanent dot being placed by the above means in the centre which needed to be found, the brass-plate slide is tightened up with the 5/16 in. thumb-screws FF, while the slide D is made a tight hand fit on the wood strip, and kept in position on the strip by means of the semi-circular tenons and grooves C and H.

While on the subject of lining-off yokes for motors and generators, a useful tip, gained from long experience, will, it is hoped, be of interest. It is this: So line-off the yoke and the pedestal bores that the armature, when in its bearings, lies rather higher than the pole-piece bore; the reason is that the armature in work can never get higher, but may easily get lower, especially should there be much "scraping-in" of the pedestal bearings. It should be noted that if the shaft is lower, say .005 in. by bearer scraping, or by running, there will be a difference of 0.01 in. between the armature and top-pole piece and the armature and bottom-pole piece.

The writer has experienced success by marking off the yokes for "pole-piece" boring 0.01 in. lower than the bearing centres. The armature becomes then at the outset nearer the top poles than the bottom, a condition not to be deprecated, because there is a redeeming feature; with bearer scraping and with running under load the centralisation of armature and pole-pieces gets better rather than worse (if the 0.01 in. difference is not observed).

Electrifying the Farm. By R. Harrison Storer

There is an urgent need for means of hauling a plough cheaply: mobile power is wanted, the more adaptable the better

NOW that so much prominence is being given to the subject of electro-farming it may be well to pause a little and take stock of the position from a broad angle. Recent articles in this journal have inspired confidence in electrical development to an extent that was not given serious consideration a few years ago, but farming changes are slow and, according to some opinions, take place in "fifty year cycles" of complete change; therefore I wish to draw attention to an aspect that has received little prominence in the electrical world.

From the exclusive use of horses for ploughing there was a slow change to steam, which, in turn, is giving way to internal-combustion engines in the form of tractors. Two trends of the last-named method may be of interest, namely, that in the U.S.A. the trend is favouring petrol rather than paraffin, due to its lower price in many territories; while on the Continent of Europe the trend is towards crude-oil engines of the Diesel type, due to their lower working cost. While this may be of small concern to the electrical engineer it is going to prove a very big factor in the attractiveness, or otherwise, of the farm load; then what about an electric tractor? A farm load will not build itself on its own accord, so let it be clearly understood and induce us to recognise a few simple facts.

A Question of Finance

Farm electrification, like any other, is all a question of finance; so long as both the supplier and the consumer gain, all is well. Provided the farmer can reduce his costs and the supply undertaking meet its own, the future is assured. Farmers, like all others, seek to gain; they spend to secure a return and are human enough to desire the best of the bargain. Farmers are not alone in farming matters; it is a community of interests, scientists for every phase of agriculture, agricultural engineers and salesmen, farmers (both landlords and tenants, mechanically minded and otherwise), farm employés, and last, but not least, the proverbial farm critic.

Not only the farmer, but the agricultural engineer also and all directly concerned, are engaged in reducing the cost of land work; what is the electrical industry, as a whole, doing towards this? Giving supplies of electricity will not in itself gain the farmer, or the desired farm load. The cost of supply, or the cost of a drive, is relative to other factors, and it is to these other factors that all interested electrical engineers should direct their attention.

On the tractor side we see the striving to reduce the working cost of the land, and now the development of a four-wheel drive commends itself in progress towards efficiency. On arable farms there is the development of the "round the field system of ploughing"; do we realise what that means? Here, in my opinion, lies a very grave, if not the greatest, danger to the general adoption of electricity on the farm, or shall I say on the land? What load is there on a farm that is really attractive to the supply undertaking? What problem is there in finding out the cost of giving a supply and the return necessary for that cost? What amount of engineering is required to drive a stationary machine at a designed speed? Rural electrification belongs to the province of the financier-engineer and the farm drive by electric motor (which is more simple than an engine) comes within the scope of a mechanic.

Electrifying and equipping the farmstead is comparatively simple. What can be done in that direction was proved years ago, so that, apart from the financial ability of the farmer and the supplier of the electricity, there is no problem. But such is not the case with the big problem of the land; if there is general adoption of the "round the field system of ploughing"—with the aid of oil tractors—how are we going to combat and replace it with electric tractors or cable winches? Are we going to allow another "fifty-year cycle" to elapse before we have the looked-for, and in the future necessary, high farm load?

The Electric Tractor

I feel constrained to say that, while engineers and many others ofttimes write the farmer off, or down, as "too conservative," there is at least an important step relating to electro-farming where the "shoe is on the other foot," namely, the McDowall electric tractor, the history of which reads more like fiction than fact. A practical proposition, if not *the* practical one, for a capable arable farmer has designed and is developing an electric tractor on sound fundamental principles. Embodied in these principles is the experience of an arable farmer and knowledge of what is required on an arable farm. Consequently, the tractor works, but, due to restriction and the set-backs common to most new and original ideas, together with lack of co-ordination on the electrical side, much development remains to be done. However, progress and development continue; having followed the inner workings necessary to attain the present-day results, filmed and observed working difficulties that would never exist with co-operative effort, I feel quite sure that here we have the practical proposition in the rough state.

Tractor work will always have an advantage over cable haulage in adaptability and in that it follows closer to previous working experience, either with horses or present-day oil tractors. Cable haulage may, under suitable conditions does, do very well for ploughing work, but what of cultivation and the winning of the crops, to say nothing of the power take-off that farmers attach so much importance to at the present time?

The "pros and cons" of the various systems and possibilities are another subject. It is enough to say here that now we are developing the use of a separate engine for the cutter bar of machines for cutting crops mechanical power does not end at ploughing.

Where then does the electrical industry, as a whole, come in? What is it doing towards the practical proposition of land tillage? What is it going to send to Rothamstead? To sit on the fence is not a charge to be laid at the door of the farmer only, for Major McDowall has given the lead to the electrical industry, despite his handicaps.

Pioneers in farming systems and methods are at work, but electricity is not their mainstay. This is all too evident in the fact that one exponent of the "round the field system of ploughing" ploughs 16 hours a day—using acytelene head lights, not electric—and has thereby reduced his production cost by 50 per cent.

Therefore, in view of what has been stated, once this system takes a general hold we may have to wait another fifty-year cycle before attaining to a useful and productive load for our lines in rural areas. That much progress has been made in the extension of rural lines and the equipment of farmsteads is common knowledge to all interested in the subject. At the moment we are educating the farmer to use electricity, to adopt the best method of drive, the electric drive, but what is the electrical industry, as a whole, doing as its share of pioneer work?

Mobile Power Wanted

To say that the land is not a practical proposition is to declare ourselves unresourceful; to expect farmers generally to pay four figures for cable-haulage outfits is to hold ourselves open to ridicule. Surely we can meet the farmer half way in this land problem and, incidentally, build up a load, apart from that of railways, which will soon be the only load left to develop. One cannot plough round the field with electric power, but surely one can employ more mobile electric power than is at present offered by a mere stationary electric motor. The farmer will readily admit the benefits of electricity, but he has unfortunately got to look elsewhere for assistance in dealing with the source whence he lives—the land.

There is an urgent call, then, for some means of hauling a plough cheaply and, from the electrical industry's point of view, the means should take an electrical form, but it cannot expect many Major McDowalls, or to have its work done for it. Mobile power, the more adaptable the better, is urgently required of the electrical industry if it desires to attain to its supremacy.

Now that so much useful work is being done by various sections of the electrical community, marriage with the agricultural community is not a Utopian idea. Will the combination of the old and the new industries attack the land problem? Nothing short of the completely electric mobile outfit can be termed an expression of the electrical industry's realisation of agriculture's requirements.

Enough has been said on the subject of agriculture and electricity on the farmstead to almost over-rate the one and destroy the harmony of a complete union. Electricity that cannot help the land it passes over is of little interest to the farmer, but electric power that will help him to a better control of the land it passes over may go a long way to ease the wayleave trouble, and it will certainly be given every opportunity by the farmer to prove its worth.

In conclusion, I would say that when reading agricultural and agricultural-engineering journals and at the same time our own electrical journals, one seems to find the subjects in water-tight compartments, that agriculture is being given every assistance only by its own community in dealing with its biggest problem—the LAND!

How long will it be before America takes from this country these early pioneering ideas—to send back the developed machine, as has happened in the past?

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Profit Sharing. By A. W. Willsmore, F.R.Econ.S.

The effects of general depression

THE recently published official statistics on profit sharing and labour co-partnership in 1930 show a net decrease of eight in the number of schemes in operation at the end of the year in place of the usual annual increases that have characterised the returns since 1922. Does this mean that profit sharing is unable to stand the acid test of industrial depression? Taking the figures as they stand there is a *primâ facie* case for this view, especially so since 1922—a comparable year of industrial depression—also showed a decline after several years of progressive increases. But superficial figures are dangerous, and the business statistician early learns to doubt the obvious inference. Let us then examine the present case to see whether this conclusion is sound.

At the end of 1930, the total number of undertakings known to have been practising profit sharing in this country was 491, and of this number 170 were co-operative firms. The total number of employés covered by the schemes in operation was 238,000, including 32,900 in co-operative firms, so that the representative figures for ordinary industrial businesses were 321 firms with profit-sharing schemes covering 205,000 participants. In view of the enormous number of ordinary companies and trading firms in this country it must be admitted at the outset that the adoption of profit sharing has not yet been sufficiently wide to justify the drawing of any really definite conclusions from the decline in number of schemes in operation in a particular year. Furthermore, of the total net decline of eight schemes in 1930, four represented abandoned schemes in the co-operative societies. The position in non-co-operative businesses was that eight existing schemes were dropped, four because of the business depression and the remainder for various other causes, but against these, four new schemes were adopted, making a net decline of four schemes. In these circumstances the solution to the problem we have set cannot be found in the overall figures, but must be sought in the fundamental nature of the profit-sharing scheme itself.

The Objects in View

The object of profit-sharing and labour-co-partnership schemes, as has been pointed out before, is to secure a blending of the twin incentives of self and company interest. This is achieved by giving the worker a stake in the profits of the company, and in some industries—notably the gas supply business—the experiment has proved very successful. The nature of the scheme, however, is such that it cannot indiscriminately be recommended for adoption by each and every company. Experience has proved quite definitely that if a direct incentive can be given the worker in the form of piece-rate pay, bonus schemes, or group incentive plans, better results are achieved in the way of improved output and cheaper production than those realised by profit sharing. Profit sharing is, however, peculiarly applicable to those cases where, by the nature of the business, it is impossible to establish any form of reward for individual results.

In the second place, profit sharing has not proved a success in those industries where the profits of the concern depend more on external conditions than upon its own internal efficiency. This fact is substantiated by the official records of the history of the movement which show that out of thirty-two co-partnership schemes known to have been started in the agricultural industry, 25 schemes, or 75 per cent, had been discontinued by the end of 1930. Engineering and shipbuilding also show a high "mortality" rate, but in the gas, water, and electricity supply group, only 16 schemes have been discontinued out of 85 known to have been started, while the group of financial businesses shows only one scheme dropped out of 13 started. Of course, the discontinuance of a scheme does not necessarily mean that it has proved a failure. For instance, of the eight schemes dropped in 1930, two were discontinued on account of reconstructions or amalgamations, while in a third case the scheme came to an end simply because the shares set aside for issue to employés had all been issued. But all the same, profit sharing and labour co-partnership are most successful where: (*a*) there are stable profit conditions—usually due to the existence of some sort of monopoly; (*b*) where direct payment by results is not possible; and (*c*) where there is little danger of over-capitalisation.

Application to Public Utilities

The gas industry meets these needs very well, and not only has a virtually unqualified record of successful co-partnership schemes but accounts for nearly a quarter of the total number of participants in profit sharing in all industries. The electricity supply industry shares the same qualifications and can expect equal success. In such industries as these there is little to be feared from trade depression, but in competitive industry there must obviously be the danger of reduced profits prejudicing the scheme.

Even so, however, it is by no means definite that declining profits mean the failure of co-partnership schemes. Both in 1929 and 1930 no bonus was payable, owing to insufficient profits, in about a quarter of the total number of schemes for which returns were received, yet the schemes are still alive. In fact, there is reason to believe that profit-sharing and co-partnership schemes can be launched with success in years of depression with the object of avoiding industrial unrest. The success of such a scheme, and for that matter any co-partnership scheme, however, must depend upon the attitude of the management behind it. Provided the scheme is not one-sided and is put forward in a whole-hearted fashion a measure of success is reasonably sure in any industry, and under the particular conditions outlined above success is virtually certain.

Carrier Telephony

The first system of its kind in England has been installed for the London, Midland and Scottish Railway

THE first system of carrier telephony to be superimposed on any railway company's telephone circuit in this country is now in operation between Derby and Manchester on the London, Midland & Scottish route. The installation was decided upon after Mr. A. F. Bound, signal and telegraph engineer, Col. P. D. Michod, principal assistant, and Mr. J. R. Edwards, telephone technical engineer, of the L.M. & S. Railway, had made thorough investigations into the possibilities of the application of carrier telephony on their lines.

The system employed is the Standard Telephones & Cables, Ltd., D.1 single-channel short-haul carrier system, and this particular equipment is the 152nd manufactured and installed by that company throughout the world in the last few years.

To relieve the congestion of telephone traffic between Derby and Manchester an additional circuit was required, and this facility is now given by the use of the aforementioned system without in any way interfering with existing circuits. The physical circuits on which the carrier is superimposed are the Derby-Crewe and the Crewe-Manchester lines, the latter forming one side circuit of a phantom group. These circuits consist of 150-lb. and 200-lb. copper open-wire lines, with about 12½ miles of cable in short sections along the route.

The basic principle of the system, as with the other systems of Standard Telephones & Cables, Ltd., is to suppress the carrier current and to transmit one side band only, enabling voice frequencies over a range of 2,650 periods per second (extending from 150 to 2,800 p.p.s.) to be transmitted over the system. Such a range of frequencies permits speech of very good quality to be obtained. For ringing purposes either the existing d.c. or a.c. supply may be used, and this is transmitted over the carrier circuit without causing any interference with the physical or phantom circuits. The carrier channel terminates in the usual switching facilities and affords the same degree of flexibility in traffic operation as do ordinary toll circuits. Moreover, it does not introduce any feature requiring the switchboard operator to differentiate between it and any other circuit.

The installation of this system has provided a first-class telephone circuit which can be extended to various distant points by connecting it to the ordinary voice-frequency circuits. The equipment is very stable and the only maintenance normally required is the switching on of the power in the morning and its disconnection at the end of the day.

The economic advantages and the high-grade performance of carrier telephone systems are now widely known. They are used to augment the number of communication channels ordinarily obtained from an open-wire circuit, particularly when the wire circuit is already fully exploited to provide physical and phantom speech circuits, and composite and telegraph circuits. It may be pointed out, however, that the adoption of carrier systems in preference to the erection of additional wire circuits is not always dictated by consideration of lower annual cost, as these systems are sometimes installed for reasons of expediency rather than of economy; for example, to afford immediate relief to circuits which have suddenly become congested with traffic. Carrier systems can be employed temporarily on routes subject to seasonal variation in traffic, such as occur at popular seaside resorts. Apart from this and other special applications, they are normally adopted in preference to other means of increasing the number of communication channels for reasons of low annual cost and high-grade performance.

Protective Cable Anchoring

An instance of submarine power cables withstanding a ship's dragging anchor

IN 1927 two submarine power cables were supplied and laid across the Brisbane River by Siemens Brothers & Co., Ltd., to the order of the Brisbane City Council, N.S.W., Australia. The cables are of the impregnated paper-insulated, lead-covered type for working at 11 kV, 3-phase. The lead sheath, after being thoroughly compounded, was protected by two layers of oiled paper with compound between and the paper is followed by a layer of thin brass tape, applied with an overlap, as a protection against toredos (submarine borers). The brass tape is followed by a strong textile tape, over which is applied the bedding of tarred jute yarns. The armour consists of a double layer of galvanised-steel wires, each wire 0.16 in. in diameter. A serving of tarred yarn with compound is applied between the two layers of wires, and the cable is finally heavily served and compounded overall. A cross section of the cable is reproduced below.

The two cables, which are identical in make-up and finish, were laid side by side, a few feet apart, in a trench dredged in the river bed. Both were paid out simultaneously and guided into the trench by a diver, who accompanied the vessel the whole way across. One of the accompanying illustrations is a view of the laying vessel just before paying out commenced.

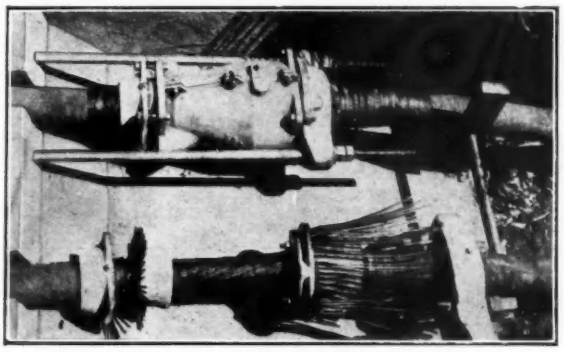
The Brisbane River is navigable by large steamers well above the reach across which these cables are laid. In February, 1931, due to very heavy rains which had fallen up country, the river was in full flood and a very strong current was flowing towards the sea. A large steamer got into difficulties and let go an anchor in order to check her way. As the vessel passed over the power cables the anchor fouled both the latter, and the ship's way was so effectually checked that her progress was entirely arrested. But the strain on the steel anchor chain was so great that it parted at the ship's hawsehole, leaving the anchor and several fathoms of chain attached to the electricity supply cables on the river bed. The ship proceeded on her way without reporting the incident and nothing unusual was noticed. It was not until an eye-witness of the occurrence reported it seven days later that the electicity supply authority became aware that anything had happened. Neither of the cables had broken down. Measures were at once taken to raise the cables and discover the extent of the damage; both were found to have been badly crippled at one point and, as a result, a length of several yards was cut out from each. Short lengths of new cable were jointed in and the mains were put back into commission, without any further incident.

Cross Section of Cable

At each side of the river the submarine cables are jointed to the underground cables by means of ordinary lead-sleeve joints in cast-iron boxes. As a precaution against undue tensile stress in the joints, both cables had been anchored at each side of the river, between the joints and the water, by means of Siemens "Bucket Suspender" anchoring devices, two of which are shown in position in one of the accompanying pictures; the top one is shown completed and the lower one in course of installation. To attach the device, the armour wires are interrupted and the ends on the side on which the strain will be sustained (that is, nearest the water) are doubled back over a cone-shaped fitting; a hollow cone is then brought up over the wires, which are held between the two. The hollow cone is made fast to an anchoring block by means of adjustable tension rods, and it is obvious that the greater the tension the tighter the cone clamp will grip the wires.

The cast-iron box between the tension rods is intended to provide protection for that portion of the cable which is denuded by the wires having been turned back. The ends of the wires on the land side are gripped in a simple form of clamp which provides for the electrical continuity of the armour. When the cable is double armoured only the outer layer is cut, the inner layer running straight through. With the object of excluding foreign matter, the box is filled with bituminous compound after installation.

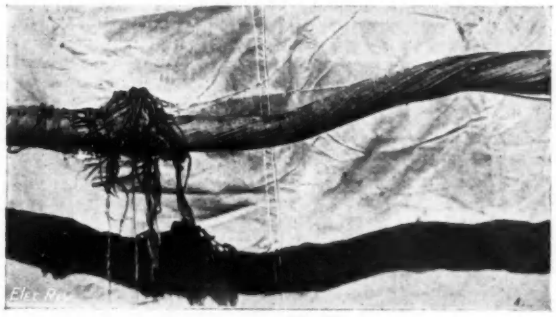
The effectiveness of these devices is indicated in the present instance by the fact that, though the strain was sufficient



Method of Anchoring Cable

to snap a stud-link ship's anchor chain almost two inches in diameter, the power cables beyond their anchors were not in the least bit disturbed. Had the anchors not been provided, there is little doubt that the ends would have been hauled out of the banks and the cables towed down-stream.

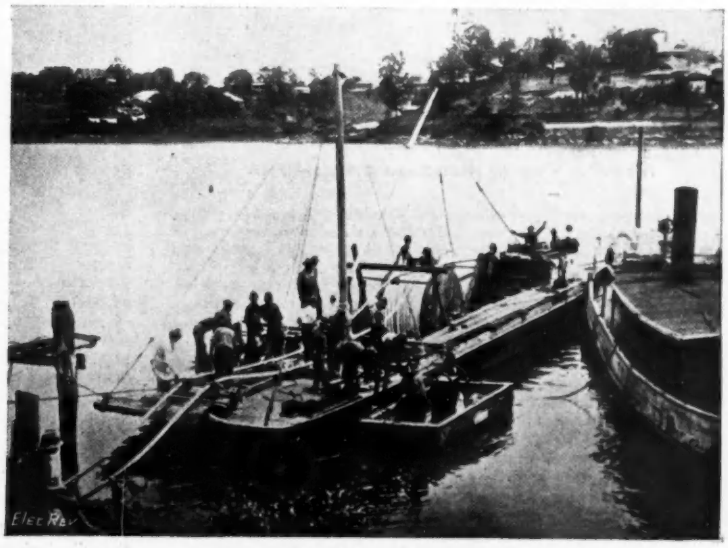
The reproduction of one of the pieces cut out of the power cable together with the cross-section view at the most distorted point indicate that, though the cable was far from circular, the dielectric thickness had been substantially preserved and



Damaged Cable Armouring

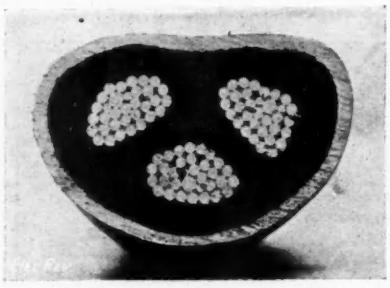
it would probably have withstood 11,000 volts indefinitely. The lead sheath was not broken in either case.

This incident demonstrates the fact that when river-crossing cables are suitably protected they can hold their own against ships' anchors. It also indicates the futility of costly dredging operations, undertaken with a view to placing cables beyond the reach of dragging anchors, unless the trench is effectively



Power Cable Laying at Brisbane

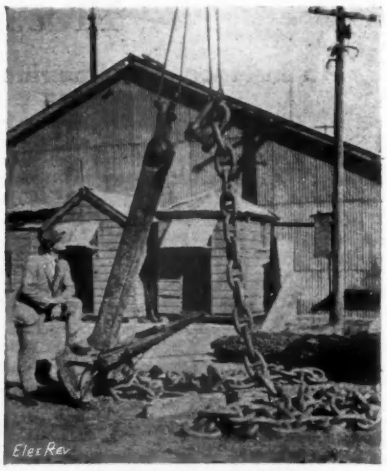
back-filled after the cables have been laid in position. Even when this precaution has been taken, it may still be ineffective unless the depth at which the cables are buried in the river bed exceeds the depth to which the largest anchor is likely to penetrate. In the present instance the trench was confined to the shallower part of the waterway, or about 75 per cent. of the full width. No dredging had been done in the navigable canal, which is of considerable depth at all states of the tide.



Distorted Power Cable

Of the two accompanying illustrations, the left-hand one shows the manner in which the power cable was deformed. To the right are shown the ship's anchor and its steel chain after their recovery. The fact that this strong chain was broken indicates the mechanical strain to which the cable was subjected.

The anchoring device used is known as the Siemens "bucket suspender" and had the precaution not been taken of fitting it to the power cables their under-water sections would in all probability have been dragged apart from their shore ends with the consequent interruption of the power supply.



Ship's Anchor and Chain

Soil-Heating Experiments. By Gordon S. Mitchell

A net revenue of 240 dol. from an electrically-heated cucumber plot, as compared with 150 dol. from an unheated plot

THE use of electricity to force plant growth has recently been tried out successfully at Watson Station, in Southern California, by engineers associated with the Southern California Edison Company. The scheme involves the burial of electrical conductors in the soil, under the place where the plants are to be located, with a thermostat in the circuit to regulate the loading to maintain the required temperature. The problem is to place the product on the market early, inasmuch as the price received is determined largely by the time of availability of the crops. For example, cucumbers sell for approximately 5 cents apiece in Los Angeles during the summer months, but for the period of three or four weeks before the opening of the regular season the selling price is from 20 to 25 cents. Strawberries, normally selling at 10 cents per basket, are worth from 30 to 40 cents per basket for the

Cucumber Vines in Heated and Unheated Soils

month immediately preceding the strawberry season. This, of course, is due to the fact that the entire crop matures at approximately the same time, tending to flood the market and lower the price.

In co-operation with Mr. I. Matsuda, a Japanese truck farmer, two one-tenth acre plots were placed at the disposal of the engineers. One plot was wired and the other plot planted unwired to serve as a check against the results from the wired plot. Both plots were planted on the same spring day, and all gardening duties were performed at the same times and in the same manner. The wired plot was underlaid with rubber-insulated copper wire such as is commonly used in the U.S.A. for house wiring, the wires being laid four feet apart and about eight inches deep. The wires were connected into what is known as a "return circuit" and supplied at 110 V. Seven hundred feet of wire was used to underlay the one-tenth acre, and the thermostat was set to maintain an even seventy deg. F. During the day the heat of the sun was usually sufficient to maintain the required temperature. However, inasmuch as Watson Station lies very near to the sea coast and adjacent to the lowlands between Los Angeles and the Los Angeles harbour city of San Pedro, Calif., there is a great deal of fog and many cool days. During the night the temperature fell to forty or fifty deg. F. in the unwired plot. Observation showed that current flowed in the circuit of the wired plot for about two hours out of every five on an average. Cucumber seeds were planted in both plots in rows about four feet apart, the length of the field, and placed directly over the wires in the wired plot. The interesting results of the experiment were apparent from the sixteenth day of the test, when over one half of the crop in the wired plot had matured and had been marketed before the first cucumber had reached maturity in the unheated plot. The heated plants actually produced many more cucumbers than did the unheated ones. Taken over the entire period of the test, nearly twice as many cucumbers were obtained from the heated than from the unheated plot, while all the cucumbers from the heated plot were of a larger size known as "choice" in the marketing circles.

The electricity consumption cost for the period of the experiment was about $40 at five cents per kWh, and the cost of the apparatus and wiring was $100. The revenue from the yield of the wired plot was $300, while the unwired plot produced $150. Adding the total cost of power and the installation, the heated plot showed a gain of ten dollars over the unheated plot in ultimate yield. But the initial cost should be spread over five years time, tests having shown that the wire and associated apparatus will remain serviceable for that period at least. However, the actual time will in a measure depend upon purely local conditions of soil, weather, and so forth; yet a five-year life may safely be taken as the minimum. The gain of the heated over the unheated plot thus becomes ninety dollars. It should not be overlooked that the indiscriminate wiring of farm plots would only tend to place the normal market period ahead by so many days, and the higher price would be an economic impossibility. The idea, however, is fundamentally sound, and experiments may well be carried out to determine the economic advisability of wiring certain plots for certain crops.

At the present time the Southern California Edison Company is preparing to launch an extensive series of experiments to determine the value of electrical heating for various other agricultural products. The use of artificial heat in greenhouses for maintaining an even temperature and forcing the growth of delicate flowering plants is one branch of the same general problem which is to receive attention, and the use of electricity for heating brooders and incubators on poultry farms has proved in preliminary tests to be particularly advisable. Some of the advantages noted have been the absence of fumes from the combustion of gas or coal, even heat throughout the space in the brooder or incubator, an accuracy of temperature control impossible to obtain with other forms of heat, the minimum amount of labour necessary to maintain an electrically equipped poultry farm and the complete absence of flames which tend to create fire hazard.

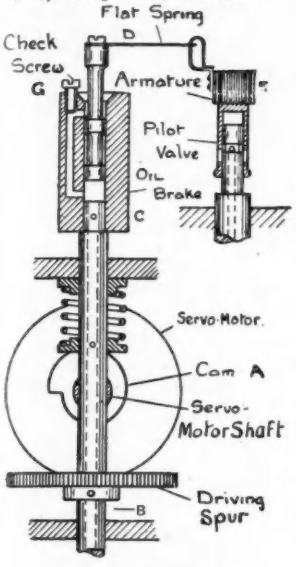
The Edison Company maintains at all times staffs of engineers who devote their entire time to the development of such projects as the one described.

It is expected that the wiring of garden plots on certain California truck farms will assume rather increased importance during the coming year as a result of the experiments described above.

A Non-contact Voltage Regulator

Resembling the hydraulic regulator used for water turbines, the N.C. apparatus acts instantaneously and produces a very high operating torque

THE "N.C." (no contact) voltage regulator introduced comparatively recently in this country by ISENTHAL AND CO., LTD., Victoria Road, North Acton, W.3, differs from the usual vibrating-contact apparatus in that not only are all vibrating contacts eliminated, but also the regulator is capable of producing considerable mechanical force in direct proportion to the variations in the voltage, current, power factor, &c. In general design it resembles closely the hydraulic regulator used extensively for the speed control of water turbines, except that instead of a centrifugal governor as the control element there is electro-magnetic control. A servo motor with liquid medium is employed, which, without introducing appreciable inertia into the regulation, develops the operating torque, ensuring reliability of operation, a high degree of accuracy and rapidity of regulation, with a minimum expenditure of energy in the control mechanism. The new equipment may be used, not only to operate large field regulators, but also induction and regulating transformers for supply systems, electrodes for electric furnaces, as well as to effect direct control of prime movers.

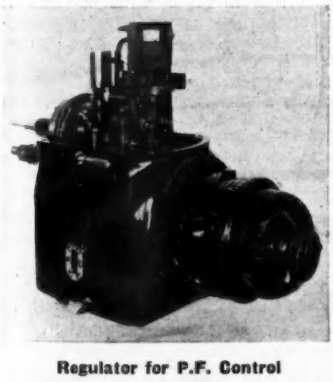


Elastic Back Coupling

Reference to the accompanying drawings will facilitate explanation of the construction and operation of the N.C. regulator. The electro-magnet A is connected across the mains or to the terminals of the generator, and between its poles a spring-controlled armature moves. This armature directly or indirectly operates the slide valve of a hydraulic system and controls the supply of pressure oil which a suitable oil pump forces into the servo motor, which embodies a single wing rotating in a cylindrical housing, with the spindle coupled to the various regulating elements.

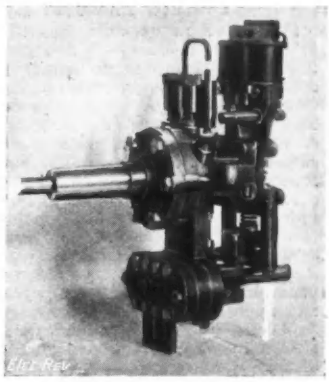
If the voltage of the generator drops, the pull on the armature is accordingly reduced, and the slide valve can move downward; the pressure oil then enters into tube 1 and space 2, whilst the oil in space 3 of the pump can escape by tube 4 and an aperture 5 back into the oil reservoir. This results in a displacement of the pump wing, its spindle being turned in a clockwise direction, and the contact lever of the field resistance coupled with it being moved so as to reduce the field resistance. The resulting higher generator voltage pulls up the armature and the distributing slide, and as soon as the voltage has attained its normal value, the armature and slide valve are in their midway position and no further regulation takes place.

The control consists of one or more electro-magnets with a very small air gap, so that the system produces very considerable magnetic pull for a minimum of electrical energy. Regulation commences even when the armature displacement is of the order of 0.01 to 0.1 mm., and because of the considerable magnetic pull and the small mass to be moved, the regulation is effected very rapidly. In the case of variations in load the regulating movements commence before the voltage fluctuation has had time fully to develop. The voltage adjustment may be effected from a distance by an adjustable resistance, and the sensitiveness of the apparatus may likewise be altered, whilst in operation, by simple adjustments


Regulator for P.F. Control

The servo motor and the mechanism operating it can be put out of commission simply by turning a by-pass tap, and this operation may be arranged for remote control also. The oil pumps are of the valveless type with hardened and ground gear wheels and shaft, immersed in oil.

Another important feature of the regulator is the elastic back coupling which overcomes the fact that changes in the flux of the generator, and therefore changes in the generator voltage, do not take place in phase with the movements of the field regulator, but owing to the magnetic inertia of the field lag more or less behind the regulator movement. In order to bring the voltage back to its normal value rapidly it is necessary that the movement of the field resistance should provide for "overshooting." By the cam A, on the shaft of the servo motor, the vertical spindle B, rotated by spur gears, is shifted vertically and its upper end is connected over an oil damping device C to a flat spring D which, in turn, engages with the armature of the electro-magnet E. When the voltage drops, and the armature sinks, the servo motor turns in a clockwise direction and thus, by means of the cam, lifts the flat spring and so acts upon the armature that its movement is interrupted after sufficient overshooting has taken place. If the voltage now rises, the regulator assumes a new stable position corresponding to the new working conditions. The oil damper has an adjustment G to regulate the degree of coupling between the vertical spindle and the piston carrying the flat spring, and since the damping arrangement is continually rotated, no undesirable influences, such as friction, thickening of the oil or sticking, can manifest themselves.

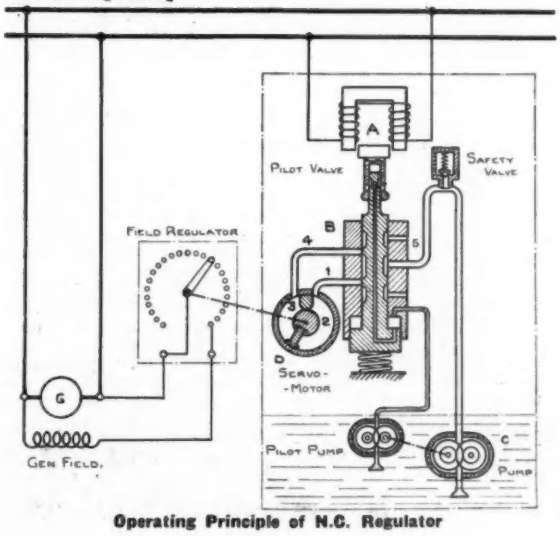

Unit Without Motor and Case

The size of the servo motor determines the torque available for operating resistances, &c. The standard regulator is produced in six models covering a torque range of from 5 lb. ft. in the smaller sizes to 1,000 lb. ft. in the largest model.

The apparatus is very compact and, since the whole of the mechanism runs in oil, is practically frictionless. The pump is contained in a substantial oil tank and is usually driven by a suitable motor attached direct to the casing, but where more convenient belt drive from a shaft may be substituted. The apparatus may be mounted either on a panel or a pedestal.

Since overload protection is generally used simultaneously with voltage regulation, a design of regulator has been produced in which both functions are combined in one apparatus, having one common servo motor, but two electric controls and two oil pressure control valves. The two controls are quite independent of each other, but act on the same regulating resistance. It is also possible to arrange two overload protection systems for inclusion in two phases of the supply. For voltage regulation of three-phase generators applied through the field of the exciter machine, the voltage control magnet of the "N.C." is supplied from a potential transformer.

The regulator is arranged to work with progressive regulating speed, *i.e.*, small voltage variations are dealt with slowly and heavy variations very rapidly, so that there are no shocks. The adjustment of the voltage to different values such as are needed in practice (within + and − 10 per cent. of the standard voltage) is effected by varying the resistance supplied with the regulator.



Operating Principle of N.C. Regulator

Failures of Boiler Materials

Examples of the cracking of boiler plates, etc., due to defective material, bad workmanship, and bad working conditions

In his memorandum for 1930 to the Executive Committee of the Manchester Steam Users' Association, Mr. V. B. Harley Mason, general manager and engineer-in-chief, deals with the question of the behaviour of steel at high temperatures, and discusses some of the cases of failure of boiler materials that have been investigated in the Association's laboratories during the past year. The following extracts are taken from the latter section of the memorandum.

In the investigation of the various kinds of failures which occur in boiler materials, probably those which are the most difficult to account for are the cracking of boiler plates. The causes can roughly be classed under three headings: namely, defective material, bad workmanship, and bad working conditions, but many failures are due to combinations of two or all of these causes.

Cracked Plates of Lancashire Boiler

The boiler in question was 27 ft. long and 8 ft. 1 in. in diameter, made up of five parallel belts of plating ⅞ in. thick; the longitudinal seams were double riveted with double butt straps, and the circumferential seams lapped and single riveted. The working pressure was 100 lb. per sq. in. The failure occurred at the back lap of the second belt of the shell, where a crack was found to run between 14 consecutive rivet holes. This belt was an inner one, but on cutting out the cracked portion the adjoining third (and outer) plate was also found to be cracked. The seam of the inner plate was very badly cracked, the crack being in places at least 1/16 in. wide, and was not particularly well suited for a metallurgical examination. The seam of the outer plate was cracked to a lesser extent, the cracks being very fine and running mainly from rivet hole to rivet hole and appearing only on the inner or concave surface of the seam. In both plates there were signs that an excessive riveting pressure may have been employed, for there was a distinct thinning of the plates at the rivet holes.

The fact that a crack passes along an occasional grain boundary does not necessarily classify it as an intercrystalline or chemical crack, and in this case it is believed that failure was the result of the straining of the plates during manufacture which resulted in the slow development of the cracks during service. In order to obtain some idea of the connection between the riveting pressure and the work-hardening of the plate, three experimental seams were made and riveted up at three different pressures. The seams consisted of two pieces of mild-steel plate ⅞ in. thick, 14 in. long, and approximately 4 in. wide. In each seam there were four drilled rivet holes, ¾ in. diameter and 2½ in. pitch, the centre line of the holes being 1 5/16 in. from the seam edges which normally would be the caulking edges, but which in the experiments were planed true and unbevelled. As regards plate thickness, rivet diameter and pitch they were the same as those that failed in the above-mentioned boiler. Prior to riveting, the plates were annealed by being placed in a furnace, raised to a dark red heat and allowed to cool slowly with the furnace overnight. All the plates were reasonably flat and, being held by two bolts, were well bedded together.

The three seams were sawn through along the centre lines of the rivets, the surfaces polished and hardness tests made all over them. In the case of seam 1, riveted at a pressure of 56 tons per sq. in., very little work-hardening had taken place, there being only a slight increase in hardness close to the rivets. In seam 2, riveted at 87 tons per sq. in., considerable work-hardening had taken place round the rivets and under the rivet heads. It appears as if such a pressure is rather on the high side, and about 65 tons per sq. in. seems to be a reasonable pressure to use in order to obtain a tight seam without excessive work-hardening. In the case of seam 3, riveted at 143 tons per sq. in., the pressure was obviously excessive, as shown by the work-hardening, the whole portions between the holes being considerably hardened with an increase near to the rivets. The similarity of the strain-hardening results obtained in the case of this seam 3 and the cracked boiler seam just discussed provides strong evidence that excessive riveting pressures had been used during manufacture.

Tube Plate Breakdown

The tube plate of the front bottom drum of a water-tube boiler of a type in which, to enable straight tubes to be used, the circular form had been departed from, had cracked to a considerable extent along the outer row of tube holes. The tube plate was 15/16 in. thick with tube holes 2 15/16 in. diameter pitched 4¼ in. apart between centres. The cracks were on the fire side of the plate and commenced in each case at the tube holes. Many of the cracks were too large and wide for microscopical examination, but a portion of plate was received in which the cracks between the holes were very much finer, and on this portion the Association made several interesting investigations.

The possibility of caustic embrittlement was considered, as the water in this boiler was softened in a water-softening plant, but as no sample of boiler water could be obtained the matter could not be further investigated. For several reasons, however, it is unlikely that caustic embrittlement was the cause. Firstly, the cracks were not wholly of an intercrystalline character, but in many cases they ran across the crystals in the manner typical of stress and fatigue cracks. Secondly, the cracks were not in a position where any concentration of caustic could have taken place as might have been the case had the cracks occurred in a riveted seam. For such concentration to occur between the tubes and the plate one would have to assume badly-fitting tubes of which there is no evidence. Further, there is reason to believe that the water contained sufficient sulphate to inhibit embrittling action. The Association is therefore of the opinion that the cracking of the drum was the result of excessive local stress, due probably to a combination of a high working stress resulting from distortion of this non-cylindrical part, weakened by the tube holes, and stress set up during the expanding of the tubes into the plate.

The case emphasises the desirability of retaining the circular shape for pressure vessels, as even though such plates as the one referred to be annealed after pressing and may stand up to adequate hydraulic tests, the conditions of operation set up movements and stresses in such irregular structures as cannot be estimated.

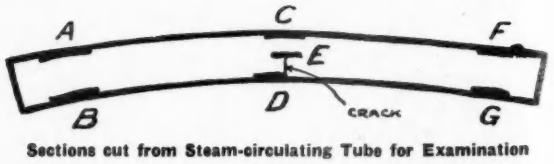
Cracked Shell of Vertical Boiler

A failure that recently occurred in the shell plate of a vertical steam-navvy boiler is of a somewhat different nature from those previously described, as the crack in the shell plate did not run between rivet holes, but was situated along the edge of the inner lap of the longitudinal seam of the top belt, starting about 13 in. from the seam of the shell and crown plate and extending for about 16 in. Some 2½ in. from the crack there was a cast-iron bracket, riveted to the shell plate, with a lug to which a tie bar was fitted for the purpose of steadying the boiler when the navvy was working.

It appears in this case that the primary cause of the trouble was the original workmanship, the plates not having been laid up properly when the seam was made, but forced into shape in riveting. The fact that one of the two stay brackets was attached to the boiler close to the seam which failed cannot be ignored. This bracket would transmit severe shocks to the weakened plate during the working of the navvy, particularly in stony ground, and the design in this respect is regarded as undesirable. The strain-hardening set up at the lap joint due to the pulling together of the plates during riveting and caulking may have set up differential strain and corrosion effects which, accentuated by the vibration, caused the crack along the edge of the lap.

Steam Circulating Tube Failure

Another case examined was the failure by cracking of a tube from a water-tube boiler. The sixth tube from the left in the second row from the top of a bank of 20 steam-circulating tubes between the front and middle drums of a water-tube boiler had cracked circumferentially for a distance of approximately 3 in. The tubes were 3¼ in. diameter by ¼ in. thick and approximately 4 ft. 6 in. in length. Besides the cracked tube, the first and second connecting tubes from the left were wasted at the neck on the front end, so also was the first tube in the lower row. Some of the tubes in the front row and the tenth tube from the left in the back row were slightly bulged. Referring to the accompanying sketch seven sections, A, B, C, D, E, F and G, were cut from the tube, sections A, C and F from the upper part, which was not directly exposed to the fire, B, D and G from the lower or exposed portion, and E from the side in the immediate vicinity of the crack. Examined under the microscope, even at a high magnification, no abnormality was found in the structure of the metal as revealed by sections A, C and F from the sheltered portion of the tube. Of the remaining sections B, D, E and G which were exposed, G



Sections cut from Steam-circulating Tube for Examination

alone showed a normal structure. In B, D and E the areas of laminated pearlite had broken up and the iron carbide had spheroidised.

Although overheating doubtless played a part in the ultimate failure of the tube, it is probable that local stresses were set up by breathing of the tube. An examination of section E cut at the extreme end of the circumferential crack revealed three or four fine cracks starting from the inner or steam surface of the tube. The cracks obviously commence at the inner surface of the tube and gradually work through to the outside. These cracks are similar to those previously described in the case of the steam-navvy boiler, and are due to a combination of stress and corrosion, the stresses in this case being amply accounted for by breathing of the tube.

New Apparatus and Devices

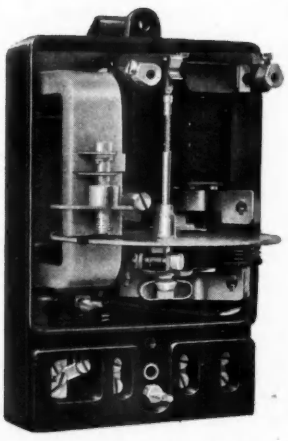
for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Kinema-screen Masking Gear

To meet the demand for efficient and reliable equipment for the easy control of masking for kinema screens to accommodate small and large pictures, W. J. FURSE & CO., LTD., Traffic Street, Nottingham, have introduced the electrically-operated "Magnascope" gear. It is constructed with a strong iron frame, prepared to suit the purchaser's screen, the sliding maskings being of robust design, and made to take customers' black masking. Provision is also made for moving the movietone mask. To enlarge or decrease the screen it is only necessary for the operator to press a push-button in the operating box, when the sliding maskings expand outwards until the pre-set large- or small-picture size is reached and the maskings automatically stop. The complete equipment consists of the screen frame, sliding panels, worm reduction gear, electric motor, drum, guide wheels, and push-button controller with one push-button box, all suitable for a maximum size of picture of 25 ft. 6 in. by 32 ft.

Improved Supply Meter

An a.c. induction motor-type meter, F.L., having a straight-line load curve from one-tenth load to 25 per cent. overload, an equally flat curve at 0.5 p.f. and similarly flat voltage variation curves (the deviation from normal being not more than 0.25 per cent. fast and 0.5 per cent. slow at 10 per cent. under and over voltage, respectively) has been introduced by FERRANTI, LTD., Hollinwood, Lancashire. In none of the three characteristic curves referred to is there a greater variation from normal than 0.5 per cent. between one-tenth and one-twentieth load, yet the meter is for all practical purposes independent of variations in standard frequency. Test curves show that a 50-cycle meter registered only 2 per cent. slow at 45 cycles and 1.5 per cent. fast at 55 cycles when tested from full to one-tenth load at 0.5 power factor; corresponding figures obtained with similar tests at unity p.f. were 0.5 per cent. fast at 45 cycles and 0.5 per cent. slow at 55 cycles. To summarise briefly, the meter is accurate within 2 per cent. from one-twentieth load to 25 per cent. overload at any power factor down to 0.5 lagging or leading, and voltage variations have negligible effect between 200 and 250 volts. The overload current capacity is 200 per cent. continuously. The meter is entirely uninfluenced by stray fields with either of the three types of cover available, glass, aluminium, or "Nomag" cast-iron. Rubber gaskets, and leaded joints in the case of glass panels in the metal covers, ensure water-tightness. For the fixing of the glass cover there are two small levers at the top and bottom of the cover, respectively, and when these have been pushed outwards the cover can be lifted off; replacing the cover is correspondingly simple. Important features are the easy accessibility of all "adjustments," the large-size screws employed, and the provision of locking devices in every case. The bottom jewel and top pivot of the rotor bearings are both arranged to clip into position, the construction being such that correct alignment and functioning of the rotor is automatically assured. In manufacture the disk and spindle are placed in jigs and held accurately in the correct positions while they are permanently united by molten metal. The permanent magnet is mounted in position by wire saddles riveted to the case back, and the shunt and series systems are rigidly assembled as one unit. Either clock or cyclometer pattern train gear can be fitted, in both cases the train being assembled as a self-contained unit, readily fitted or removed, with correct meshing of the driving wheel and worm automatically assured. It is further claimed that detailed examination will convince the most sceptical that the common objections to this form of counter mechanism are now without foundation.



Interior of Ferranti F.L. Meter

Special Vacuum Cleaner

An electrically-operated hand vacuum cleaner designed for the cleansing of upholstery in motor buses and coaches has been introduced by VIKING SALES, LTD., Harvester House, 37, Peter Street, Manchester. It weighs only 4¾ lb. and measures overall 14 by 7 in. The motor is of universal type for a.c. or d.c. in any standard voltage. There is a fan on the armature for cooling purposes, and the armature shaft runs on self-aligning ball bearings. The suction nozzle can be got right into the corners of the upholstery; it is 5¼ in. wide and has a fixed, replaceable, brush across the rear lip of the orifice to disturb clinging particles. It functions well on Bedford cord, cord velvet, and moquette, and solid objects such at match sticks, cigarette ends, and orange pips can be taken up easily.

Fractional H.p. Motors

The range of fractional h.p. motors developed by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, includes not only motors for d.c. circuits, but also split-phase and repulsion-induction machines for single-phase circuits and universal machines for both a.c. and d.c. supplies. The following are claimed as distinctive features for these machines: Interchangeability as regards fixing dimensions of d.c. and 50-cycle motors of similar h.p. rating; similarity of operating speeds for a.c. and d.c. motors; silent running and long bearing life ensured by the use of substantial sleeve bearings of phosphor-bronze; efficient lubrication by large waste-packed oil reservoirs; replenishing of oil necessary only twice a year; direct switching on the line for all types; quick and easy wiring; compactness and minimum weight compatible with sturdy construction; and liberal overload capacity and low temperature rise.

B.T.-H. Split-phase Motor; ⅛ and ¼ h.p.

The split-phase induction motors, types BA and SA, are general-purpose motors for the usual domestic and industrial applications, and they exert twice full-load torque at starting. For very frequent and heavy starting the repulsion-start induction motors, types RBA and RSA, are recommended. Special attention has been devoted to the design of these motors to secure noiseless operation, and on all sizes except ¾ h.p. the brushes are lifted from the commutator after starting; the motors then run as plain induction motors. They may be operated on either of two voltages, namely, 100 or 200, 110 or 220, 120 or 240; and also within 10 per cent. of the voltage stamped on the nameplate. Types BD and SD motors are suitable for all general-purpose applications and (with the exception of the ⅛ and ¼ h.p. sizes) for the more exacting duties mentioned in connection with the repulsion-start induction motors. Very careful consideration has been given to the design of the brush-gear and the type of brushes used, to ensure silent operation and perfect commutation. These motors are compound wound and may be switched directly on the line. Type BDA motors—1/50, 1/30, and 1/16 h.p.—will operate to give the same power output on either a.c. or d.c. circuits for similar voltages.

Electrically Heated Washer

The "Margery Daw" electrically-heated washer just marketed by GEORGE GREEN & CO., "Gee-Gee" Works, Chapel Road, West Norwood, S.E.27, has been designed to fill the gap between the expensive electrically driven washing machine and the ordinary wash copper. The clothes container is of heavy-gauge copper, tinned inside, and has a water capacity of 12 gal. and a dry-clothes capacity equivalent to two full-size blankets. The efficiency of the machine as a dirt-extractor is due to the agitator which pumps water through the meshes of the material. The water is heated by a 3-kW "Gee-Gee" immersion heater, and the apparatus may therefore be used as a boiler only if desired. A wringer may be obtained with the machine as a complete unit or not, the top being designed for the attachment of any type of small wringer. The outer casing is of vitreous-enamelled steel, and all the other external metal work is chromium plated. A lid of special wood completes the outfit. The height without a wringer is 33 in., and the floor-space dimensions are 20 by 21 in.

"Margery Daw" Washer, showing Centrifugal Agitator

Improved Insulating Material

Interesting claims are made by MOULDING DEVELOPMENTS, LTD., 34, Victoria Street, S.W.1, for "Gummon," an improved material for high-voltage work which is put forward as an alternative to porcelain. It is entirely free from rubber and is not affected by light, atmosphere, or ozone. It will withstand high temperatures, hot transformer oil, weak acids, and alkalies. Further, it is non-inflammable and non-hygroscopic.

Parliamentary Notes

[By our Special Parliamentary Reporter]

Electricity Supply in Gloucestershire

On July 28th MR. PERKINS asked the Minister of Transport whether he was aware that the village of Cranham, near Painswick, Gloucestershire, was not yet supplied with electricity by the West Gloucestershire Power Co., and whether he would ask the Electricity Commissioners to allow the city of Gloucester Electricity Department, which already supplied electricity to a place 1½ miles away, to extend its territory so as to include the village of Cranham.

MR. PARKINSON said he was informed that the Electricity Commissioners were already investigating the question whether a supply could be given to Cranham, and were at the present time in communication with the Corporation on the subject.

Unemployment Relief Schemes

On July 30th, MR. JOHNSTON, Lord Privy Seal, informed Sir G. Bowyer that it was estimated that work equivalent to the employment of 450,000 persons for a year had been provided by schemes resulting from legislation passed by the Government since June, 1929. It was estimated that at present 250,000 people were employed, directly and indirectly, on relief schemes and 150,000 of these were employed under schemes receiving grants-in-aid under the Development (Loan Guarantees and Grants) Act, 1929, and the Colonial Development Act, 1929. The total cost of these schemes was put at about £120,000,000, while the grants made totalled about £43,000,000. The figures did not include the ordinary expenditure of the Central Electricity Board.

Russian Machinery Orders

In a written reply to Mr. W. W. Henderson, the LORD PRIVY SEAL states that during the period July 1st to 29th orders for machinery to a total value of £1,069,984 were placed by the Russian trade representatives in London. These included a contract valued at £79,495 for electrical equipment and another at £97,598 for turbines, placed with the Metropolitan-Vickers Electrical Co., Ltd.; and two orders for the General Electric Co., Ltd., for transformers (£19,577) and turbines (£18,500).

Central Electricity Board Contracts

On July 31st CAPTAIN MARGESSON asked the Minister of Transport whether he could state the total amount of the contracts placed by the Central Electricity Board: the number of miles of main transmission lines now in operation and the number under construction; and the output of electricity in Great Britain in each year since the Electricity (Supply) Act was passed.

MR. MORRISON said he was informed that at May 31st last the Central Electricity Board was committed to expend under contracts either placed or about to be placed, sums amounting to over £20,000,000. This figure did not include expenditure on standardisation of frequency in connection with which the Board had specifically approved expenditure estimated to amount to £5,250,000. Over 540 miles of the main transmission lines were now in operation and in addition some 940 miles of transmission lines had been completed or were in course of construction, sections of which would be brought into use at early dates. The output (energy sold) of electricity by authorised undertakers in Great Britain in each year since the Electricity (Supply) Act, 1926, was passed, was as follows: 1927, 6,850 million kWh; 1928, 7,603 million kWh; 1929, 8,596 million kWh; and 1930, 9,030 million kWh.

Legal

Radio Reorganisation Schemes Sanctioned

IN the Companies Court last week Mr. Justice Maugham again had before him the petition for the compulsory winding up of Aeonic Radio, Ltd., together with a petition by that company for the sanction of the Court to a scheme of arrangement.

MR. EVERSHED, for the company, said that in July, 1930, it passed a resolution for voluntary liquidation, with a view to entering into an agreement with Electrical & Radio Products, Ltd., to take over its assets and liabilities. There was no doubt that the Aeonic Co. was quite insolvent, one of the many factors causing this being the inability of Electrical and Radio Products, Ltd., to pay off the liabilities of the Aeonic Co. and to fulfil other obligations. Under the scheme the agreement with Electrical & Radio Products, Ltd., was cancelled. Mr. J. L. Gottlieb had a mortgage for approximately £10,000 on the freehold premises of the Aeonic Co. and the substance of the scheme was that he was to take the factory and other freehold property, the mortgage being discharged, and he was to pay the liquidator a sum which would give the unsecured creditors 4s. in the £, and to pay the Marconi Co. £1,000 in satisfaction of a claim in respect of infringement of a patent.

HIS LORDSHIP sanctioned the scheme conditionally upon the payments being made by Mr. Gottlieb not later than October 1st next, and the costs of the petitioners having been paid in cash, the winding-up petition was dismissed with costs.

His Lordship also had before him the petition of Henrion Carbons, Ltd., for the compulsory winding up of Electrical and Radio Products, Ltd., together with a petition by the company for the sanction of the Court to a scheme of arrangement with its creditors.

MR. WYNNE PARRY, for the company, said that shortly after it entered into the agreement with the Aeonic Co., the company found itself in difficulties, as the liabilities it had taken over turned out to be much greater than anticipated. Various executions and distresses had been levied and it was manifest that the company could not go on without some arrangement with its creditors. The scheme, which had the assent of the debenture holders, bound two classes of creditors—certain creditors who were originally creditors of Electrical & Radio Products, Ltd., by novation, and persons who became creditors after that company was formed to take over the assets of the Aeonic Co.

His Lordship sanctioned the scheme and dismissed the winding-up petition by consent.

The " Letrik " Litigation

THE action by Messrs. A. P. Lundberg & Sons, Ltd., against Letrik, Ltd., in which Mr. Justice Eve gave judgment on July 28th (as reported in our last issue) was mentioned to his Lordship on July 29th on the defendants' motion to vary the register of trade marks by limiting the plaintiffs' mark " Lektrik " to the class of goods which the plaintiffs put on the market, thus excluding from it electric combs and goods of a like character. His Lordship had held that there had been no infringement or attempt to pass-off goods as of the plaintiff's manufacture.

MR. BURRELL, for the defendants, said that as the result of a discussion the plaintiffs had agreed not to contest the defendants' right to an order on the terms of the motion and would pay the Registrar's costs, while the plaintiffs would not ask for the costs of the motion.

The Royal Lancashire Show

A Further Demonstration of Rural Applications of Electricity

ONE of the features of electrical interest at the Royal Lancashire Agricultural Show held at Wavertree, Liverpool, on July 30th, 31st and August 1st and 3rd, the most interesting were in connection with incubation and brooding of chickens, the milking of cows and milk cooling. Visol Laboratories were showing the " Petersime " electric incubator, and the " Secura Mammoth " cabinet incubator was to be seen on the stand of the Secura Incubator Co., Ltd. Both of these incubators are thermostatically controlled. The former firm also showed an electrically-heated brooder so designed as to keep the temperature constant, but to allow the chickens to breathe cold fresh air all the time. Other forms of electric brooders were exhibited by Messrs. J. H. Cunliffe & Sons, and Messrs. J. Wrennall.

The Alfa-Laval Co., Ltd., exhibited the new " Alfa-Laval " magnetic milker, which embodies all the principles of the " Alfa-Laval " single pipeline milking plants, but has electric central control in place of the pneumatic control for the udder pulsators. Considerable reduction in power for operating the machines and a simplification of the plants has been effected. Other types of milking machines and skimming and separating machines were displayed by this company. Messrs. A. Grabham and Co., Ltd., also exhibited electric milking machines.

One interesting stand was that of the Liverpool Corporation Electric Supply Department in conjunction with the Electrical Development Association, the Electrical Contractors' Association, and G. G. Marsh & Son, dairymen. This was devoted to demonstrations of the numerous ways in which electricity can be used by the farmer. These included the various processes connected with milk, from the actual milking of the cow, cooling, separating and churning the milk, to the washing and sterilising of bottles and bottling; also the hatching of chicks by electricity, sorting and testing eggs, and plucking poultry, as well as pumping and water heating, clipping and shearing, and chaff cutting.

Messrs. Walker's (Liverpool), Ltd., exhibited their new direct expansion milk cooler in operation, an entirely automatic machine, which starts itself when the milk is first put over and remains in operation until the last gallon is cooled down, when it automatically shuts itself off. An electric bottle-washing machine was to be seen on the stand of Messrs. Dawson Bros., Ltd., while Messrs. Christy & Norris, Ltd., showed electrically-driven machines for disintegrating, pulverising and grinding.

Vacuum cleaners were displayed by Messrs. Hoover, Ltd., while the Sunshine Radiator Co., Ltd. had on view a new electric floor polisher which can also be used as a grinder for levelling uneven floors, and an electric vacuum cleaner.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The E.D.A. Programme for September

In view of the Faraday Centenary celebrations in September, the E.D.A. sales and publicity programme for that month naturally takes advantage of the event in urging the claims of electricity to public consideration. Special window displays have been prepared, linking up Faraday with the modern outcome of his discoveries in the shape of domestic electrical and radio appliances. The Association is also making available replicas of the simple apparatus by which Faraday carried out his principal experiments; a central window display card; and a portrait plaque. A booklet has been prepared for public distribution containing a brief biography of Faraday and an exposition of the nature of his discoveries and their ultimate development. A folder gives some details of the exhibition which is to be held at the Albert Hall from September 23rd to October 3rd.

Norwegian Power Exportation Scheme

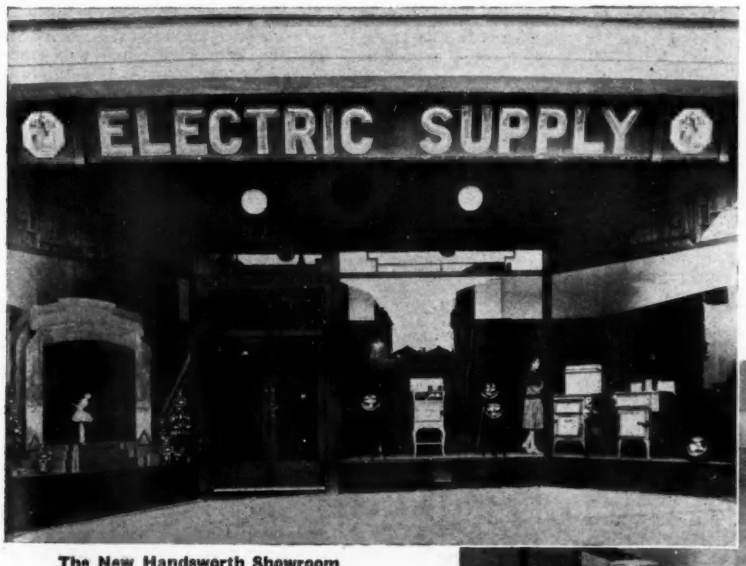
In our last issue reference was made to a scheme for the exportation of electricity from Norway to Central Europe, A company bearing the title "Studeselskapet for Norsk Krafteksport" has recently been formed in Oslo with the object of studying the possibilities. The Drusche Elektrowerke Gesellschaft, the Norwegian Siemens Co., the Oslo branches of the A.E.G. and the Brown-Boveri concerns, and a number of other electrical companies are interested in the new undertaking.

A British Company in Belgium

La Société des Etablissements J. & E. Hall is the name of a company which has recently been organised in Brussels to act as the Belgian agents for Messrs. J. & E. Hall, Ltd., Dartford.

Yet Another Birmingham Showroom

The Birmingham Electric Supply Department's scheme for the provision of showrooms in many parts of the city's suburbs is proceeding rapidly. The latest is the one just opened at Handsworth by Councillor H. K. Beale, the chairman of the Electric Supply Committee. Councillor Beale said that the Department now had four of these showrooms and contemplated opening others at Acocks Green, Kings Heath and Cotteridge. He also referred to the practical demonstrations of electrical methods which were arranged in the showrooms,



The New Handsworth Showroom

and said that in ten years the consumption per head of the city's population had risen from 150 to 350 kWh, owing largely to the Department's progressive policy.

The exterior of the showroom (which we illustrate) is designed in semi-arcade fashion and presents a very attractive appearance, with facilities for effective window displays. A day and night sign is fitted across the front of the premises. Inside there is a complete range of modern lighting fittings, and heating, cooking and domestic appliances, especial consideration being given to apparatus within the reach of persons with moderate incomes. Instead of the usual practice of equipping part of the showroom as a model kitchen, the back portion has been fitted as a small hall (also illustrated) for demonstrations and lectures.

The British Industries Fair

An unwonted brightness characterises the latest piece of publicity matter issued in connection with the Birmingham Section of the British Industries Fair. A light blue cover with a conventional sun in one corner invites the manufacturer to "Ensure a Place in the Sun, 1932." The contents describe the growth of the Fair and its national importance. It is mentioned that invitations to foreign buyers, in their own languages, are circulated throughout the world and the services provided for exhibitors are briefly summarised. A form of application for space is enclosed with the booklet.

Mr. J. P. Plant, Chairman of the Publicity Committee of the Section, states that everything sent to prospective buyers —about 100,000 of them in all—will bear the individual's name and address and will be in his own language. A small but not unimportant psychological point will be the association of the Union Jack with the flag or national colours of the country concerned. Allowing for the subdivisions by country, language and flag combinations, each of the four issues in the "follow-up" campaign to buyers will involve 130 different variations. The final "follow-up" will be a folder, printed in three colours, with numerous photographs of actual exhibits, telling the full story of the Fair and stressing new social attractions which the Committee has in mind for next February. Two booklets enclosed will give a full list of articles exhibited and general information for visitors. The double cover of the second booklet will also form admission tickets to the Fair and functions.

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during the five months ended with May last attained a value of £773,200, as compared with £907,750 in the corresponding period of 1930. There was also a decline in the exports of similar material from Germany—from £12,060,350 to £9,722,650.

Municipal Electrical Trading in Brisbane

The Executive Committee of the Brisbane (Queensland) City Council recently recommended that the trading section of the Electricity Department should be abolished. After discussion it was decided that the matter should be held over for a period of three months.

The "British Exhibitor"

On Wednesday last week at Birkenhead Lord Derby re-christened the steamship *Leicestershire* with the name *British Exhibitor*. The vessel is being refitted to act as a floating exhibition of samples of British goods and it will leave on November 1st for a visit to the leading South American ports. The equipment of the *British Exhibitor* will include a 100-line exchange manufactured and installed by the Automatic Telephone Manufacturing Co., Ltd. This will be of the Strowger marine type and the service will link up the various officials in charge of the exhibits, as well as providing intercommunication facilities for the ship's personnel. The telephones will be of the latest G.P.O. standard handset type

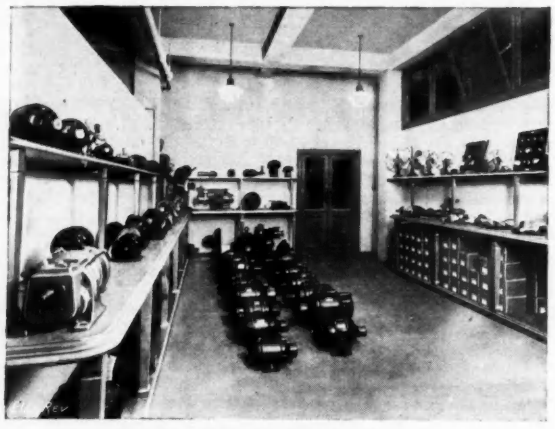
The Lecture and Demonstration Hall

The Cambridge All-Electric House

Messrs. FALK, STADELMANN & Co., LTD., inform us that they supplied all the electric lighting fittings for the all-electric house of the Cambridge Electric Supply Co., Ltd., described in our issue of July 17th.

The " Sun " Motor Showroom

The accompanying illustration shows a further apartment in the handsome new showroom extensions which were recently opened by the SUN ELECTRICAL CO., LTD. Here is main-



The Sun Company's Motor Showroom

tained a stock of motors of many types and sizes, electric fans, portable electric tools, &c. As will be seen, the showroom is an airy, spacious and well-lighted apartment.

Russian Electrical Imports

Further light is thrown on the Russian foreign trade situation by a memorandum just published by the Russian Dept. of the University of Birmingham, under Professor S. Konovalov. Similarly to the report by the Commercial Secretary in Moscow, to which we referred in our last issue, the memorandum briefly describes the structure of the Soviet foreign trade organisation and its methods of procedure. It is shown that although the rate of growth of import and export trade is far below the estimates of the Five-Year Plan, it is still higher than the pre-war rate of development. During the 2¼ years ended with 1930 exports increased by 33 per cent. to 1,036.4 million roubles, and imports by 12 per cent. to 1,058.8 million roubles (against 1,520.1 millions and 1,374 millions, respectively, in 1913). The proportion of the import total attributable to electrical and engineering goods has more than doubled; in 1913 the figure was 2.5 per cent. and in 1930 5.9 per cent. In actual values, the imports of this class rose from 34.5 million roubles in 1913 to 63.4 millions in 1930.

According to one of the tables, Germany supplied 11,916 tons of electrical machines and appliances to Russia during 1930, as compared with 6,717 tons in the preceding year. Comparison with the British quota is difficult, for in the section dealing with trade with this country electrical appliances alone are shown, the quantities being given as 1,380 tons in 1929 and 2,097 tons in 1930, out of totals of 13,942 tons and 25,689 tons. We are also credited with the supply of 15,917 tons of wire in 1930 (10,983 tons in 1929). From the United States, the Soviet Government is said to have purchased 6,456 tons of electrical goods and scientific instruments (another different classification) in 1930, against 1,612 tons in 1929. This memorandum is the second of a series of four or six which can only be obtained as a whole from the Russian Department of the University at the price of 8s. 6d.

The F.B.I. on World Conditions

The " Business Barometer " of the Federation of British Industries reviews existing economic conditions and deals with the prospects for the third quarter of this year, and reaches the following conclusions:—" The breakdown in Germany has interrupted the readjustments in world prices and in the domestic situations of the principal industrial countries which were under way during the first half of the year. Unfortunately the resultant European financial disorganisation cannot fail to interfere with this process and postpone still further the date of ultimate recovery. Overshadowing even the inter-allied war debt problem and Reparations is the urgent need of a fall in the long-term rate of interest. The outflow of gold and its attendant rise in the Bank rate puts an end to the possibility of a large-scale conversion of war loan this year, and the reduction of the long-term rate of interest to 4 per cent. or less. While this is probably the most serious result of the present crisis, the failure of the recent conference to make satisfactory arrangements to ensure continuing confidence in Germany's financial credit has produced a situation fraught with serious danger to European stability. The one crumb of comfort, so far as British industry is concerned, is that it can look to a diminution in the future of the pressure of German competition in the export markets of the world."

United States Electrical Exports

The official statistics of the United States Department of Commerce show that during May the total value of electrical equipment exported was $8,861,138, as compared with $12,170,252 in May last year. The total for the first five months of the year was only $42,216,068, as against $60,798,965 in the corresponding period of 1930. The fall in the May total was principally due to reductions in exports of the following items: D.c. generators, from $100,496 to $16,643; steam turbo-generator sets, from $31,797 to $626; batteries and accumulators, from $751,896 to $545,456; transforming and converting apparatus, from $944,376 to $215,694; power switches and circuit breakers (over 10 A), from $288,814 to $72,615; stationary motors, from $421,834 to $159,229; electric fans, from $147,631 to $51,149; household washing machines, from $234,632 to $124,492; telephone apparatus, from $519,048 to $182,076; furnace electrodes, from $244,637 to $106,800; bare copper wire, from $215,043 to $139,769; and insulated copper wire, from $406,204 to $187,569. The only increases of any importance occurred in the cases of a.c. generators (2,000 kVA and over), from $39,500 to $335,718, and radio apparatus, from $1,448,719 to $1,784,087.

New French Companies

Among the concerns recently formed in France are the Société de Transport d'Energie Electrique de la Moselle, Paris (5, Rue Jules Lefebvre); La Société Hydro-Electrique des Vosges, Mulhouse, capital £240,000, to establish a large hydro-electric power station in the Vosges district; La Compagnie Française des Lampes, Phares, Diffuseurs et Reflecteurs " Cesar," Paris (113, Rue de Turenne), to manufacture lighting fittings; and La Société Nantaise de Téléphonie pour l'Installation, la Vente et la Location d'Appareils Picart-Lebas, Nantes (46, Rue de Gigant).

Hints for Commercial Visitors

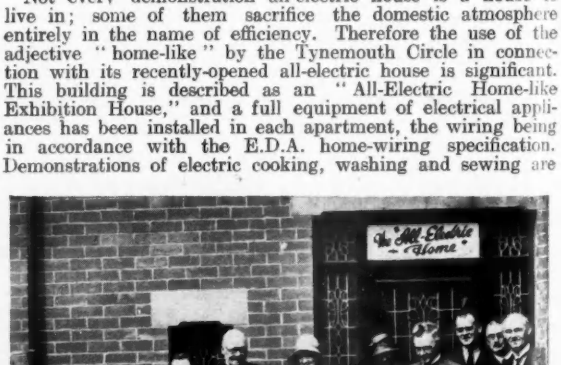
The latest of the " Hints for Commercial Visitors," published by the Department of Overseas Trade, relates to Czecho-Slovakia (No. C.3598). It contains a summary of commercial statistics, advises as to the routes to be taken, and indicates the cost of hotel accommodation, &c.

Another memorandum of this series (No. C.3583) deals with the British West Indies and contains useful matter relating to each of the islands and also to the British colonies in the north-west of South America.

The Netherlands East Indies are similarly covered in No. C.3594, which was also issued by the Department last week.

All-Electric House at Tynemouth

Not every demonstration all-electric house is a house to live in; some of them sacrifice the domestic atmosphere entirely in the name of efficiency. Therefore the use of the adjective " home-like " by the Tynemouth Circle in connection with its recently-opened all-electric house is significant. This building is described as an " All-Electric Home-like Exhibition House," and a full equipment of electrical appliances has been installed in each apartment, the wiring being in accordance with the E.D.A. home-wiring specification. Demonstrations of electric cooking, washing and sewing are



The Opening of the Tynemouth All-electric House

being given daily, and about a thousand people a day are making an inspection of the house, which is to remain open until August 15th. The opening ceremony was performed by the Mayor of Tynemouth (Councillor J. Robinson), and in the accompanying reproduction of a photograph taken on the occasion he is seen with the Tynemouth borough electrical engineer (Mr. C. Turnbull), who is chairman of the local E.D.A. Circle.

The B.E.A.M.A. Index

The B.E.A.M.A. Index of Activity, quoted by the *Board of Trade Journal*, gives a figure of 82.0 for June (1924=100), as compared with 83.1 in May and 103.0 for June, 1930. The output of authorised electricity undertakers during June was 153 on the 1924 basis, against 158 in May and 140 in June last year.

The Beauharnois Inquiry

The Canadian House of Commons recently appointed a committee to investigate the affairs of the Beauharnois Light, Heat and Power Corporation, which was formed to develop a concession on the St. Lawrence River estimated to be capable of producing half a million h.p. The report of this committee was published last week; it makes allegations of improper practices against officials of the company, certain senators, and others, and states that development is proceeding according to plans which have not received Government approval. It is considered, however, that the scheme is fundamentally sound and should be proceeded with. The report was debated in the Dominion House of Commons last week, when it was decided that the Beauharnois Corporation should be completely reorganised under Government supervision, and a special Bill has been prepared for the purpose.

Portsmouth and the National Register

The Portsmouth Education Committee has drawn the attention of the Electricity Committee to the fact that there are firms of substance in the city whose names are not on the National Register of Electrical Installation Contractors, and who are debarred from tendering for municipal electrical work. It is asked that the matter should be re-considered.

Floodlighting Schemes Wanted

Contractors willing to make proposals for floodlighting the Uttoxeter War Memorial are requested to communicate with the engineer, Uttoxeter U.D.C., Town Hall, Uttoxeter, Staffs.

Recent Contracts

The WARDLE ENGINEERING CO., LTD., has secured the contract for the electric street lighting of the railless-car routes at Nottingham. The contract comprises the equipment and "Bruce" lanterns for approximately 22 miles of roads.

Private automatic telephone installations have been ordered from STANDARD TELEPHONES & CABLES, LTD., by the Carlton Collieries Association, Barnsley, and by Swift Stores, Ltd., and Messrs. Thackray's, both of Leeds.

Price Reductions

The MANOR ELECTRIC OVEN & FIRE CO., 7, Sutton Street, Charing Cross Road, W.1, announces reductions in the prices of its cookers, together with a variation of the discount arrangements.

Book Notices

A large photogravure print relating to the eleventh Exide Battery Service Convention held at Bournemouth will be issued as a supplement to the next number of the *Chloride Chronicle*. A number of excellent photographs are reproduced of the delegates, who attended the Conference from parts of the world as far distant as Tunisia, India and Australia.

"Science Abstracts" (A and B). Vol. XXXIV, No. 403, July, 1931. London: E. & F. N. Spon, Ltd. Price 3s. 6d. each.

"The British Empire in 1950—A Peep in the Future," by George Morris. Pp. 95. Manchester: John Heywood, Ltd. Price 2s. 6d.

New Catalogues and Lists

W. J. FURSE & CO., LTD., Traffic Street, Nottingham.—Illustrated leaflets, describing the company's "Magnascope" screen masking gear and panic bolts for exit doors of cinemas, theatres, &c.

BERKELEY & YOUNG, LTD., "David" Works, Rushey Lane, Tyseley, Birmingham.—Folders giving particulars, illustrations and prices of "Bandy" electric fans and "Davidson" domestic electrical appliances.

The MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Two further window bills issued in connection with the "Marconiphone" summer sales campaign, illustrating the use of the "55" portable radio receivers in wet weather. Also an attractive poster indicating the various applications of "Marconi" valves, and a window transparency of the new "Marconiphone" dealers' sign.

TAYLOR TUNNICLIFF (REFRACTORIES), LTD., Albion Works, Longton, Staffs.—A calendar-blotter for August, referring to "Fishspine" beads.

L. E. WILSON & CO., LTD., Hudson's Court, Corporation Street, Manchester.—Catalogue 312, containing particulars and illustrations of the Crouse-Hinds Co.'s floodlights and industrial lighting units.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Two leaflets describing push-button controllers for electric dinner lifts.

E. K. COLE, LTD., "Ekco" Works, Southend-on-Sea.—An attractive showcard and poster advertising the company's new "Radiorecorder."

W. H. ALLEN, SONS & CO., LTD., Queen's Engineering Works, Bedford.—A quantity of literature dealing with "Allen" airless injection Diesel engines, steam turbines, condensers, pumps and other power plant.

Trade Announcements

MR. G. H. TAYLOR, formerly Manchester manager for Messrs. Wheatley, Kirk, Price & Co., has commenced business on his own account as engineering valuer, arbitrator, and estate agent at 16, Albert Square, Manchester.

Messrs. A. F. BULGIN & CO., LTD., have acquired and equipped a new factory at Abbey Road, Barking, Essex.

Bankruptcy Proceedings

W. G. Leslie, St. Paul's Square, Carlisle, trading as "The Carlisle Ignition Co.," electrician.—This debtor, arrested on a warrant issued by the Carlisle Registrar, appeared for his public examination recently at Carlisle. The previous examination had been adjourned for a thorough examination of the debtor's accounts since a fire at his premises in November, 1929. The statement of affairs showed gross liabilities of £1,313, of which £1,268 was expected to rank for dividend, and assets of £534, leaving a deficiency of £734. The Official Receiver said that he had drawn up a new set of books, which showed an income of £1,811, an expenditure of £1,109, and a sum of £700 not accounted for. The debtor could not explain that, and admitted that he had kept his books in an unsatisfactory manner. The Official Receiver said that the case was unsatisfactory and should be adjourned *sine die*; the Registrar agreed and made an order for the release of the debtor.

H. C. Robinson, 41, St. Botolph Street, Colchester, electrical engineer.—The public examination was held on July 30th, at the Law Courts, Colchester, when the statement of affairs showed gross liabilities of £316 and a deficiency of £281. The debtor stated that he commenced business in 1919, and was successful for a year. He then sold out for £375, but in October, 1930, opened another business with a capital of £70 which he borrowed and which was still owing. The failure was attributed to insufficient trade, and competition, although the debtor agreed that there were three similar shops in existence when he took over the business. The examination was adjourned in order that cash and trading accounts might be supplied.

K. Beeson, 46, Main Street, Mexborough, Yorks., electrical contractor.—The first meeting of creditors was held on July 30th, at the Official Receiver's offices, Figtree Lane, Sheffield. According to the statement of affairs there were liabilities of £511 and assets of £274. The public examination, held on the same day, at the County Court Hall, Sheffield, was closed.

G. N. Adamson, electrical engineer, Royal Station Hotel Yard, Carnforth.—Receiving order made, July 22nd, on debtor's own petition. First meeting, August 12th, at the Official Receiver's office, 9, Cannon Street, Preston. Public examination, August 21st, at the Sessions Hall, Lancaster Road, Preston.

W. G. Harden and **C. H. Chinery** (Harden & Chinery), electrical and mechanical engineers, 7, Barnsbury Street, Islington, N.—Receiving order made, July 28th, on a creditor's petition. First meeting, August 11th, and public examination, October 29th, both at Bankruptcy Buildings, Carey Street, W.C.

H. Roberts, electrical engineer and contractor, 41, Bloxridge Street, Langley, Oldbury.—First meeting, August 10th, at the Official Receiver's office, 191, Corporation Street, Birmingham. Public examination, September 14th, at the Law Courts, Lombard Street West, West Bromwich.

W. M. Pratt and H. V. Clark (Magson Clark & Co.), electrical engineers, 165, High Street, Hornchurch, and at South Benfleet.—First meeting August 6th at 29, Russell Square, W.C. Public examination, October 7th, at the Shire Hall, Chelmsford.

A. C. E. Applin (Applin & Burt), electrical engineer, 110, St. Mary's Road, Southampton.—Last day for receiving proofs for dividend, August 12th. Trustee, Mr. F. H. Langmaid, Midland Bank Chambers, High Street, Southampton, Official Receiver.

A. H. Start, electrical engineer, 6, Belle Vue Terrace, South Chard.—First meeting, August 7th, at the Official Receiver's office, Exeter Bank Chambers, Broadgate, Exeter. Public examination, August 14th, at the Municipal Buildings, Taunton.

W. Darlington, electrical engineer, 23, Finchley Street, Moston, Manchester.—Receiving order made, July 29th, on a creditor's petition.

D. Makin, electrical engineer, 48, Dronfield Road, Pendleton, Salford.—Receiving order made, July 28th, on a creditor's petition.

A. W. Kingston, wireless manufacturer and engineer, 9, Newman Street, W.—Trustee, Mr. G. D. Haynes, 93, Mortimer Street, W., appointed July 23rd.

Company Liquidations

Eltax (British), Ltd., Hayden's Place, Portobello Road, W.—The first meetings of the creditors and shareholders were held on July 30th at Carey Street, W.C., before Mr. H. P. Naunton, Assistant Official Receiver. A statement of affairs was submitted showing assets of £179 absorbed in debenture claims (£204); unsecured liabilities of £7,167 and a contributories' deficiency of £8,192. The company was registered in March, 1928, with a capital of £1,000, to manufacture, sell and deal in all kinds of batteries, accumulators and radio apparatus generally. The directors were W. E. Stichling and R. E. Stichling. Mr. W. E. Stichling stated that he was the proprietor of the Langham Electrical Co., Ltd., which was the agent in this country of Eltax Electro (G.m.b.H.), Berlin. In 1928 the Berlin company equipped a factory at a cost of £500 and formed the company to take over the premises and use the trade mark "Eltax." The German company subscribed the whole of the £1,000 capital. The company carried on a wholesale business only, but it found that the cost of the materials supplied by the German company was excessive and the trading resulted in a loss. In July, 1930, the German supplies were stopped and the company was obliged to purchase certain materials locally, and it was found that it was possible to sell the products at a profit. Debentures for £200 were issued on February 10th, 1931, and on the petition for a winding-up order being presented, Mr. C. Waller was appointed receiver and manager of the debenture holder. The directors attribute the failure of the company to the excessive price paid for materials supplied by the German company and to insufficient working capital. The liquidation was left in the hands of the Official Receiver.

World's Supplies (Manufacturers), Ltd., radio manufacturers, Leyton.—The statutory first meetings of the creditors and shareholders were held on July 29th at Carey Street, W.C. The winding-up order was made on June 22nd on a creditor's petition. The company was registered in October, 1930, under the style of the World's Wireless (Manufacturers), Ltd., and the name was changed in January last to World's Supplies (Manufacturers),

Ltd. The nominal capital was £500, subsequently increased to £1,800, of which £1,250 was issued. The sale of the company's products were mainly cheap portable wireless receivers. The greater part of these were sold under hire-purchase agreements by arrangements with finance companies, but, owing to shortage of capital, the company found it necessary to assign a large number of these agreements at a fairly high discount. The costs of service proved high. A draft statement showed unsecured liabilities of £2,800, preferential creditors £45, and assets estimated to produce £497. The failure was attributed to underestimating of service costs, excessive overhead expenses, pilfering at the factory, and lack of working capital. The liquidation was left in the hands of the Official Receiver.

Dorking Electricity Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Fraser.

Lochlade Electric Light and Power Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Fraser.

Private Arrangements

John Steddy, Park Street, Ashford, Kent, electrical engineer, &c.—A meeting of creditors was held recently, when a statement of affairs was submitted which showed ranking liabilities of £742. In addition there were fully secured creditors for £4,170, holding securities of the estimated value of £4,535. The assets were estimated to realise £1,065, and they were subject to preferential claims of £121, leaving net assets of £944, or a surplus of £202. It was stated that the principal fully secured creditors were the bankers, in respect of an overdraft, and they held the deeds of various properties. The business was formerly carried on by a limited company and was then taken over by Mr. Steddy. The latter had been unwell for some little time past and recent records of the trading were not available. A resolution was passed confirming the deed of assignment already executed to Mr. S. E. Foster and Mr. R. A. Rogers, of the Society of Trade Creditors, Coventry House, South Place, London, E.C. It was reported that the trustees were in negotiation with a prospective purchaser, who was to take over the business as a going concern.

D. W. Shore & Co., Fogg Lane, Newcastle, Staffs., electrical engineers.—A meeting of the creditors of the above was held recently, when a statement of affairs was submitted which disclosed liabilities of £246, and a deficiency of £178. The business was commenced in August, 1930, and the capital was £25. It was decided that unless an offer was made of 10s. in the £ within seven days, the estate should be dealt with in bankruptcy.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Aug. 4th	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate(large crystal) ,,	£52	...
a	Borax ... ... ,,	£17	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac T.N.... ... ... per cwt.	£4 5s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£85 to £90	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet and Foil ... ,,	1/1 to 2/9	...
b	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£107	£4 dec.
	Grade II ... ... ,,	£77	£3 dec.
	Grade III... ... ... ,,	£66	£1 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	7d.	...
c	,, Tubes (solid drawn) ... ,,	9d. to 9½d.	...
c	,, Wire, basis ... ... ,,	7½d.	...
c	Copper Tubes (solid drawn) ... ,,	10d.	...
g	,, Bars (best selected) ... per ton.	£64	...
g	,, Sheet ... ... ,,	£64	
g	,, Rod ... ... ,,	£64	
d	,, (Electrolytic) Bars ... ,,	£38	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£48	...
d	,, ,, H.C. Wire per lb.	6½d.	⅛d. dec.
f	Ebonite Rod ... ... ,,	1/3 to 1/6	...
f	,, Sheet ... ... ,,	1/3 to 1/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom	...
h	India-rubber, Para fine ... ... ,,	4⅝d.	½d. inc.
i	Iron, Pig (Cleveland No. 3) ... per ton.	61/-	2/6 inc.
l	,, Wire, galve. No. 1, P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£13 15s.	10s. dec.
g	Mercury ... ... per bot.	£17	...
e	Mica (in original cases) small ... per lb.	6d. to 3/6	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	8/6 to 17/6 & up	...
p	Phosphor Bronze, plain castings ,	1/1½d.	...
p	,, ,, drawn bars & rods ,,	11d.	...
p	,, ,, rolled strip & sheet ,,	11½d.	...
p	,, ,, wire ... ... ,,	1/-	...
o	Platinum ... ... per oz.	£8	...
d	Silicium Bronze Wire ... ... per lb.	9½d.	...
r	Steel, magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£112 15s. to £113 15s.	10s. dec.
n	Wire, Nos. 1 to 16 ... ... per lb.	2/10d.	1d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
o Johnson, Matthey & Co.,
p C. Clifford & Son, Ltd.
r W F Dennis & Co.

Electricity Supply

Lighting, Domestic, Power

Barrow-in-Furness.—EXTENSIONS.—The Town Council has received sanction to the borrowing of £7,440 for the supply of electricity to Askam, Ireleth, Sandside, &c

Birkenhead.—SUB-STATION EQUIPMENT.—The Corporation Electricity Committee is to apply for sanction to a loan of £5,000 for sub-station equipment.

Brighton.—EXTENSIONS.—The Corporation Electricity Committee is to arrange for a supply of electricity to be given to the somewhat scattered buildings at Woodingdean by means of a l.p. overhead system, at a cost of £2,000. Supplies are also to be given to the parishes of Hangleton and West Blatchington, at a cost of £2,650.

LOANS.—Application is to be made for sanction to the borrowing of £5,000 for the assisted wiring scheme, and £50,000 for general extensions and the provision of house services during the next two years.

Canada.—DIVERSION OF SASKATCHEWAN RIVER.—Engineers have set out from Winnipeg to investigate the feasibility of the scheme to divert the Saskatchewan River for the development of 400,000 h.p. of electrical energy. In his budget speech last February Mr. Bracken, the Premier of Manitoba, outlined a plan whereby the Saskatchewan River would be diverted through the two large lakes, Winnipegosis and Manitoba, considerably increasing the flow of the Dauphin River, where the actual power would be developed at a point about 140 miles from Winnipeg. In addition to the development works, projected dam sites will have to be studied, in particular that for the main dam proposed on the Saskatchewan River at Cedar Lake.—*Reuter's Trade Service.*

Chester.—YEAR'S WORKING.—We have received from Mr. S. E. Britton, borough electrical engineer and manager, a copy of his annual report together with a statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £95,845, as compared with £91,429 in the preceding year, while the working expenditure increased from £50,701 to £55,270. There was a gross profit of £40,575, as against £40,728, and after providing for capital and other charges there remained a net profit of £10,344, as compared with £12,400 in 1929-30. During the year capital expenditure amounted to £71,805, making a total of £620,792 now spent on the undertaking. Sales of electricity increased from 10,164,001 to 10,852,179 kWh and the maximum demand from 5,648 to 5,820 kW. Charges for electricity were reduced during the year by amounts representing a reduction in income of £3,000 and it is now proposed to make further reductions, representing approximately £1,000, in power charges and in the "unit" charge of the "all-purposes" tariff for consumers in the outer part of the rural area. New consumers to the number of 931 were connected during the year, making a total of 8,519. Considerable progress was made in the change-over scheme, discarding the overhead equipment of the tramway undertaking re-lighting the main thoroughfares, alterations to offices and showrooms, and extensions of the transmission and distribution system in outlying areas.

Chesterfield.—CORPORATION REJECTS OFFER TO PURCHASE UNDERTAKING.—The Town Council has rejected an offer made by Electric and Gas Industries, Ltd., to take over the electricity undertaking. The offer was to take over the debt of £224,000 on the undertaking and to pay, in addition, £111,000; also to spend at least £80,000 in intensively developing the concern.

Chile.—HYDRO-ELECTRIC ACTIVITIES.—The Department of Hydraulics, which was established last year as one of the branches of the Directorate of Public Works, is preparing plans for water and drainage schemes for a number of cities. The Department will work in active co-operation with the Department of Electric Services, which already has under its control about 150 public service lighting and power companies. Of these, forty produce an aggregate of between 220,000,000 and 225,000,000 kWh equivalent to 136 kWh per head of the population. Of the grand total nearly 90 per cent. are operated by the Compania Chilena de Electricidad, of Santiago. It is believed that during 1932 several important electric power developments will be begun, providing that the necessary capital can be found. Of this there should be no lack, as offers of foreign co-operation have been received. On the other hand, the Administration desires to employ as much native capital as is available to secure control. The amount to be spent on these projects by the Department of Hydraulics in 1931-32 is provisionally fixed at 35,000,000 pesos, which compares with 38,353,325 pesos during 1930.—*Reuter's Trade Service* (Santiago).

Croydon.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. J. Rendell Baker) for the past year reveal an increase from £317,676 to £347,249 in revenue, working expenses also rising from £134,285 to £150,277. Other expenditure charged to revenue amounted to £50,825 (£61,536), and there was a gross profit of £146,147 (£121,854). After making provision for capital and other charges, there remained a net surplus of £39,138, which compares with £32,016 in the preceding year. The capital expended during the year amounted to £269,775, bringing the total now spent on the undertaking to £616,086.

Sales of electricity increased from 42,091,007 to 49,842,420 kWh, and the maximum supply demanded from 19,500 to 23,500 kW. The average price obtained per kWh fell from 1.807d. to 1.649d.

Hastings.—TARIFF REVISIONS.—Revisions in electricity tariffs involving concessions totalling about £10,000 a year are recommended by the Corporation Electricity Committee.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains to Rye at a cost of £400. A supply is also to be given to the Battle Steel Window Co. and houses being built by the Battle Urban District Council, at a cost of £160.

Hull.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. J. N. Waite) for the twelve months ended March 31st last record a very healthy state of affairs. The total income, £478,420, is the highest in the history of the undertaking and shows an increase of £68,317 over the preceding year's figure. Working expenditure amounted to £260,117, as compared with £213,545, and there was a gross profit of £218,303 (£196,558) to which was added an unemployment grant of £4,000, making a total of £222,304. Loan charges, interest on deposits and income tax absorbed £169,292, thus leaving a net profit of £53,012, as compared with £54,885 in 1929-30. The total capital outlay at the end of the year was £3,263,741, of which nearly £499,000 was spent last year. Of the total, £380,491 has been met direct from revenue and reserve funds and the balance of £2,883,250 from loans. The net loan debt is £2,029,788 for which the sinking funds in hand amount to £298,306. The amount standing to the credit of the general reserve fund at the end of the year was £193,621. The assisted wiring scheme after all expenses including management and loan repayments had been met reveals a surplus of £1,238. Showroom sales and hire-purchase schemes after meeting similar obligations show a profit of £1,031. Electricity sold increased from 84,687,880 to 101,674,715 kWh and the maximum supply demanded from 32,800 to 38,000 kW. During the year supplies were inaugurated to Beverley, Hedon, Skidby, Skirlaugh and Swine and in addition a bulk supply was afforded to the South-East Lancashire Light & Power Co., Ltd., for the area covered by its Hornsea & Skirlaugh District Order. Arrangements have also been made and work is now in hand to give a bulk supply to the area covered by the Power Company's Buckrose and District Order.

Isleworth.—NEW LIFT FOR HOSPITAL.—The Middlesex County Council recommends the installation of a new lift at the West Middlesex County Hospital at a cost of £450.

Japan.—ELECTRICAL DEVELOPMENT.—It is reported by our Japanese correspondent that the Dai Nippon Electric Power and Sulphuric Acid Co., Ltd., has received sanction to erect a 23,000-kW power station on the Yeno River. The Toyama Prefectural Electric Bureau has also decided to extend its Makawa power station as soon as Government permission has been obtained.

Leeds.—PREPAYMENT METERS.—The Corporation Electricity Committee has authorised the purchase of a further 6,000 prepayment meters.

LOAN.—Application is to be made for sanction to a loan of £150,000 for electricity services.

Leigh.—YEAR'S WORKING.—The report of the borough electrical engineer, Mr. J. B. Hudson, on the working of the Electricity Department for the twelve months ended March 31st last, records a total revenue of £48,740 and a working expenditure of £32,947, leaving a gross profit of £15,798. The corresponding figures for the preceding year were: Income, £47,165; working expenses, £32,182; gross profit, £14,983. After deducting capital and other charges, there was a net profit of £2,383, as against £248 in the preceding year. During the year the capital expenditure amounted to £15,096, making a total of £257,128 now spent on the undertaking. Electrical energy sold increased from 9,120,894 to 9,140,279 kWh, but the maximum supply demanded fell from 4,700 to 4,680 kW. The average price obtained per kWh rose from 1.21d. to 1.24d.

London.—SOUTHWARK.—The Borough Council Electric Lighting Committee recommends the installation of electric cooking and heating appliances in the new flats to be erected by the Council in Doddington Grove, at an estimated cost of £5,148.

ST. PANCRAS.—*Year's Working.*—The statement of accounts of the electricity undertaking for the year ended March 31st last was submitted by the Electricity and Public Lighting Committee at a meeting of the Borough Council held last week. Revenue showed an increase from £289,787 to £309,677, working expenses rising from £133,205 to £147,899. There was a gross profit of £161,778 (£156,582), to which was added income from other sources making a total of £163,039 available. Capital charges absorbed £138,281, thus leaving a net profit of £24,758, as compared with £25,587 in the preceding year. During the year capital expenditure amounted to £84,250, making the total now spent on the undertaking £1,723,062. Electricity sold increased from 41,183,316 to 50,343,718 kWh and the maximum demand from 23,300 to 27,100 kW. The average price obtained per kWh fell from 1.60d. to 1.39d.

STOKE NEWINGTON.—The official opening of the new substation in Wordsworth Road was performed on July 27th by the Mayoress of Stoke Newington.

Lytham-St. Annes.—YEAR'S WORKING.—There was a net profit of £311 on the Corporation Electricity Department, for the past year, as compared with £1,092 in the preceding year. Revenue amounted to £66,318 as against £62,972, and the working expenditure was £50,107 (£47,564).

Manchester.—PROGRESS DURING JUNE.—During the month of June the Corporation electricity undertaking showed an increase of 2,862 kW in connections, bringing the total up to 450,579 kW. Applications received for supplies, including additional supplies, amounted to 1,328, representing a total of 3,264 kW. The number of hired cookers increased by 135, making a total of 7,899 now on circuit; applications for the hire of cookers numbered 170. Two new sub-stations were put into commission. The change-over from d.c. to a.c. had been completed in the cases of 15,585 consumers up to June 30th, while work was in progress involving 1,382 consumers.

Northern Ireland.—ELECTRICITY BOARD STARTS WORK IN ARMAGH.—The Electricity Board, recently appointed under the provisions of the Northern Ireland Electricity Act, 1931, has started operations in County Armagh. In the neighbourhood of the town of Lurgan work has been commenced on the erection of poles to carry the h.p. lines from Lurgan electricity sub-station to Portadown, Markethill, Rickhill, and Armagh.

Oswestry.—EXTENSIONS.—The Corporation Electricity Committee is to apply for sanction to a loan of £10,000 for extensions.

Plymouth.—SWITCHGEAR EXTENSIONS.—The Corporation Electricity Committee has decided to obtain tenders for the extension of the main switchgear.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SOUTHPORT.—Lighting flat rate: From 4d. to 3½d. per kWh.

YARMOUTH (ISLE OF WIGHT).—Lighting: 8d. per kWh, with a minimum of 15 kWh in each winter quarter and 10 kWh in each summer quarter. Heating 2d. per kWh. Power: First 3,000 kWh per quarter, 3d. per kWh; next 5,000 kWh,, 2d.; beyond, 1½d.

CHESTER.—Power in the city: First 250 kWh per quarter, 2d. per kWh; second 250 kWh, 1½d.; beyond, 1½d. Power in the outlying area: First 250 kWh per quarter, 2½d. per kWh; second 250 kWh, 2d.; third 250 kWh, 1½d.; beyond, 1½d. "All-purposes" tariff in the outer part of the rural area: "Unit" charge reduced from 0.9d. to ¾d.

Sheffield.—PUBLIC LIGHTING.—In his report on the operation of the Corporation Lighting Department during the year ended March 31st last, Mr. J. F. Colquhoun, borough lighting engineer, states that there are now in use in the city 19,575 lamps, of which 3,867 are electric. During the year under review 1,187 new lamps were erected (680 of which were electric) and in addition improvements were carried out in many places by increasing the size of the lamps or burners. There was a considerable extension of the system of automatic control of lamps.

Sutton Coldfield.—YEAR'S WORKING.—In his annual report Mr. T. Bloore, engineer and manager of the Corporation Electricity Department, states that the revenue of the undertaking for the past year amounted to £43,517, an increase of £5,997 as compared with the preceding year. Working expenses rose from £22,950 to £25,120, and there was a gross profit of £18,397, as against £14,571. After loan and other charges had been met, there remained a net profit of £4,758, an increase of £1,720 on the figure for 1929-30. There was a substantial increase in the sales of electricity, the total sold for all purposes amounting to 3,797,487 kWh, as compared with only 2,961,757 kWh in the preceding year. The maximum demand was 2,125 kW, as against 1,841 kW. The average price obtained per kWh shows a further reduction from 3.021d. to 2.737d.

United States.—GENERATION OF ELECTRICITY.—According to statistics compiled by the National Electric Light Association from some 400 companies, 88,591,736,000 kWh of electrical energy was generated in 1930 by public utility power stations in the United States. This figure compares with 90,084,428,000 kWh in 1929, or a decrease of 1.7 per cent. In spite of this lower output there was, however, an increase of $52,435,000 in revenue, the total from all classes of consumers amounting to $1,990,955,000.

Warrington.—ASSISTED WIRING.—The Corporation Electricity Committee has considered the question of the list of authorised electrical contractors for the assisted wiring scheme and has decided that no application is to be considered from outside the limits of the supply area of the Corporation.

OVERHEAD LINES EXTENSIONS.—The extension of overhead lines to High Legh is to be carried out at a cost of £2,250.

West Midlands J.E.A.—YEAR'S WORKING.—The accounts of the West Midlands Joint Electricity Authority for the year ended March 31st last record a total revenue of £420,972, as compared with £435,980 in the preceding year. After providing for generation working expenses (£210,692), transmission working expenses (£1,844), rents, rates and taxes (£20,888), management expenses (£13,754), special charges (£6,465), loan charges and sinking fund contributions (£155,855), there was a surplus of £11,474, as compared with £9,923 in 1929-30. Capital expenditure during the year amounted to £404,682, of which the principal items were £175,251 for buildings and £187,978 for plant and machinery; the total capital expenditure at March 31st was £2,331,575. Sales of electricity declined from 206,131,698 to 201,645,649 kWh but the maximum demand increased from 76,000 to 78,380 kW.

Traction

Argentina.—BUENOS AIRES.—A message from Buenos Aires says that the fourteenth—and largest—of the city's underground railways, to be known as the Subterraneo Lacroze, the construction of which was begun on January 1st, 1929, will be opened to traffic before the end of the year. The new railway will have a length of over nine km. and will run from Chacarita under Triunvirato and Corrientes Streets to Leandro N. Alem Street, with its terminus adjacent to the Post Office building. There will be a double track, about one-third of the structure having been built by open trench methods and the remainder by tunnelling. Power will be generated at the Paternal power plant belonging to the Lacroze Light and Power Company, and will be supplemented by delivery of a h.p. supply from the C.H.A.D.E. power system under terms contained in a special contract. The tunnel work of the second section of the subway is fast approaching completion, the track laying, electrical installation, and the stations being well advanced. Official permission to open the railway is expected before the end of August.—*Reuter's Trade Service* (Buenos Aires).

London.—L.C.C. TRAMWAY ACCOUNTS.—Submitting the accounts of the tramways (ELEC. REV., July 31st, p. 183), Mr. F. Bertram Galer, chairman of the Highways Committee, stated at last week's meeting of the London County Council that the decrease of £96,367 in the net surplus was due mainly to the adverse trade conditions and the prevalence of unemployment. The closing of the Kingsway subway had also contributed to some extent to the decrease. Many improvements had been effected during the year, among them being increased speed of cars, the institution of new services, better fare facilities, and easier transfer arrangements. It is possible that the Council will have to hand over the undertaking to the new Transport Board at the end of the year.

Lytham-St. Annes.—YEAR'S WORKING.—The Corporation transport undertaking showed a deficit of £3,959 for the past year, as against £9,262 in the previous year. Revenue amounted to £54,685, a decrease of £2,611, but the expenditure was only £33,813, a decrease of £5,491. The trams carried over 2,174,000 passengers.

Sunderland.—SPECIAL ORDER.—The Minister of Transport has made the Sunderland Corporation Light Railways (Extension) Order, 1931, authorising the construction of a light railway in the borough.

Wallasey.—YEAR'S WORKING.—The accounts of the Corporation Tramways Department (general manager: Mr. H. H. Lincoln) show a decrease in revenue from £68,240 to £61,832. Working expenses also declined from £53,415 to £48,692, the gross profit amounting to £13,140, as against £14,825 in the preceding year. To the gross profit was added income from other sources, making a total of £13,973 available, and after providing for capital and other charges, there was a net deficiency of £2,901, as compared with a net surplus of £955 in the preceding year. No capital was spent on the tramways during the year. The number of passengers carried decreased from 12,142,667 to 11,352,416 and the car-mileage from 931,355 to 909,549. The average receipts per car mile were 16.23d., as against 17.25d. in 1929-30.

Telegraph and Telephone

Azores.—TELEPHONY.—St. Michaels, with an area of approximately 300 square miles, is the only island in the Azorean Archipelago on which a telephone service is maintained. Ponta Delgada, the principal city in the Azores, and Villa Franca do Campo, the second leading communal centre on the island, are equipped with public telephones, usually installed in the village post offices. Both exchanges, as well as the public telephones, are owned by the Portuguese Government and controlled by the General Telephone and Telegraph Service Administration under the direction of the Minister of Communications at Lisbon. The exchange in Ponta Delgada is equipped with two commutator boards, each having a capacity of 360 lines. A 24-hour service is maintained, with a staff of eight girls and a chief operator, who handle an average of about 10,000 calls daily. The equipment of the exchange at Villa Franca do Campo consists of one board with a capacity of 50 connections. Service is maintained from 7 a.m. to 11 p.m. with a staff of two girls. A telephone service has been projected for the island of Terceira, but the programme has been indefinitely postponed.

Canada.—TELEPHONY.—Information issued by the High Commissioner of Canada indicates that in 1929 Canadians made 257.7 telephone conversations per head, the corresponding figures for the United States being 231 and for New Zealand 212. Denmark led the European countries with 148.6 conversations per capita, the figures for Great Britain being 32.1 and for France 19.1. In cities of 50,000 people and over Canada leads the world with 23.3 telephones per 100 inhabitants, and in the smaller towns and villages ranks secand with 10.1 telephones.

Canada, with 1,399,986 telephones, ranks fourth in respect of the number of instruments installed; 82 per cent. are under private ownership and operation. North America has 21,695,376 telephones, representing 62.84 per cent. of the world's total.

The completion of the trans-Canada telephone system is likely to be concluded in December, 1931. With the establishment of direct communication between Montreal and Winnipeg, another gap is closed in the system which will link Halifax on the Atlantic seaboard with Vancouver on the Pacific coast. In all, eight telephone systems are co-operating to bring into existence the system and to eliminate the necessity of routing many long-distance calls through the United States. Two of the circuits now in operation are equipped with carrier-current apparatus.

International Telephony.—DENMARK-GERMANY CABLE.—A new telephone cable connection is being established between Aabenraa (Denmark) and Flensburg (Germany), a distance of twenty miles. The cable, which is being supplied by the Siemens & Halske Co., of Berlin, will comprise 44 double 1.05-mm. copper conductors for telephony and a 1.1-mm. lead-covered twin conductor for radio broadcast relaying. The Royal Danish State Telegraph Department has also lately placed a contract with the same company for a submarine telephone cable between the island of Bornholm and Ystad on the south coast of Sweden. It will be of the 10-pair coil-loaded type and will contain five quads of 1.4-mm. copper conductors. The cable will be approximately 46¼ miles in length, of which 41¼ miles will be submarine, with about five miles of ground cable at the ends.

Uruguay.—WIRELESS BEACONS.—Three new automatic wireless beacons are to be erected on the coast by the Marconi Company on behalf of the Hydrographic Department of the Government. They are expected to be in commission in the summer of 1932, and are to be of the fixed omni-directional type. Two of the transmitters will be installed in lighthouses, at Lobos Island and Cape Polonio, and the third on the English Bank light vessel. They will operate on two definite wavelengths, one of 600 metres and one between 950 and 1,050 metres, but a telegraph keying circuit will be incorporated so that in case of emergency the beacons can be used as wireless-telegraph stations, in which case the 600-metre wavelength would be necessary to communicate with ships and coastal stations. Three Marconi type R.G.27 receivers have also been supplied, so that, if necessary, complete transmission and reception services can be carried on. In addition, the beacon on the light vessel will operate in conjunction with a submarine sound-signalling device, so that navigators will be able to estimate their distance as well as their direction from the light vessel.

Radio

Daventry.—RECONSTRUCTION.—It is understood that if the necessary permission can be obtained from the Post Office, the B.B.C. hopes to reconstruct the Daventry long-wave station and make it the most powerful in the country. The scheme would entail the erection of a 100-kilowatt transmitter at a cost of between £150,000 and £200,000.

Russia.—RESEARCH.—What are claimed to be important improvements are embodied in two new types of radio receiving instruments which have recently been developed by the Division of Broadcasting Apparatus of the Soviet W.E.O. Central Radio Laboratory in Leningrad. The research laboratory of the Svetlana works in Leningrad has also recently developed two new types of screen-grid valves, for which numerous advantages are claimed, which are shortly to be put on the Russian market. The Kulakow works in Leningrad have also introduced a new electro-dynamic loud-speaker.

Scandinavia.—RELAYING.—Until recently Norway, Sweden, Finland, and Denmark were unable to participate in international programme exchanges, as no cable existed to carry programmes to and from those countries. To remedy this a cable was recently laid between Zarrenzin and Kampinge to enable those four countries to take part in European broadcasting activities.

United States.—CHICAGO SHOW.—More than 22,000 manufacturers and dealers attended the recent annual radio trade show in Chicago. Although many new and interesting radio devices were introduced, the general trend on the part of manufacturers showed caution born of experience with sudden changes in the industry. A few years ago it was considered impossible to build superheterodyne and complicated multi-valve circuits in small cabinets. This year the midget set attracted most interest. Progress in valve manufacture has done much to enable engineers to design compact superheterodynes which have been fitted into very small cabinets at prices considerably below those ruling in former years, says *World-Radio*. Loud-speakers are also much smaller.

NEW TELEVISION STATION.—A new television station, the sixth in the metropolitan area of New York, has been opened and a group of entertainers gave a forty-five-minute programme before the microphone and the television camera. Guests in the same building saw good recognisable pictures, but from 14 miles away came reports that reception was marred and the images rather faint. The new station (W2XAB) will transmit daily television programmes. It sends pictures on 60 lines, the frequency is 2,750 kilocycles, and the power 500 watts. A study will be made of the causes and cure of interference, which mars the received image, and whether the underground railways, tramcars, electric signs, or lifts effect the clarity of reception.—*Reuter's Trade Service* (New York).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—September 15th. Posts and Telegraphs Department. Instrument cords. (A.X. 11023.)*

Bathgate.—Town Council. Various works, including electric lighting, in connection with the erection of public baths. Applications to Mr. W. A. Cullen, town clerk.

Belgium.—BRUSSELS.—August 12th. Belgian Telegraph and Telephone Department. Supply and laying of telephone cables and accessories at Ghent, Eecloo, Roulers, Waereghem, and Saint Nicolas-Waes. Particulars (Cahier des Charges Special No. 3-577) for 17½ fr. from Régie des Télégraphes et Téléphones, Brussels.

August 19th. Supply and laying of telephone cables and accessories in the Liège and Vervier districts. Particulars (Cahier des Charges Special No. 3-572) for 11 francs, from Régie de Télégraphes et des Téléphones, Brussels.

China.—CHINESE GOVERNMENT PURCHASING COMMISSION.—Frequency changer. (July 24th.)

Dumfriesshire.—August 14th. County Council. Supply and erection of 33-kV and 11-kV overhead distribution lines. (July 17th.)

Dundee.—August 19th. Corporation. L.p. cables. (July 31st.)

Egypt.—CAIRO.—August 24th. Ministry of the Interior. Electric lighting installation for the town of Akhmim, near Sohag. (A.X. 10970.)*

India.—SIMLA.—August 17th. Indian Stores Department. Oil engine driven d.c. generating set, rotary balancer and electrically-driven centrifugal pumps. (A.X. 11026.)*

August 27th. 35,000 carsac elements and 21,750 dry cells. (A. 11,049.)*

August 27th. Inert dry cells and caustic soda cells. (A.X. 11054.)*

Liverpool.—August 28th. Electricity Supply Department. 6,000-V metalclad switchgear for Highfield Street sub-station. (July 31st.)

London.—CENTRAL ELECTRICITY BOARD.—August 10th. 35-kV switchgear at Padiham and Burnley for North-West England and North Wales Electricity Scheme. (July 17th.)

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—August 24th. Transformers in connection with the extensions to the Barking power station. (July 24th.)

L.C.C.—August 24th. High-pressure steam and circulating water pipes, de-superheating plant, electrically-driven circulating water pumps, strainers, &c. (July 24th.)

August 20th. Wireless installation at Pinewood Sanatorium, Wokingham, Berks. (See this issue).

ISLINGTON.—September 9th. Borough Council. Laying distributor cables and earthenware pipes in certain thoroughfares. (July 24th.)

Morocco.—Société de l'Energie Electrique du Maroc. Supply and erection of a 60,000-V transmission line 37½ miles in length to the south of Marrakech.

New Zealand.—WELLINGTON.—August 28th. Post and Telegraph Department. September 15th. Automatic dial mountings and resistance spools. (A.X. 11042.)*

September 22nd. 63 miles of v.i.r. wire. (A.X. 11039.)*

Public Works Department. October 20th. Boosting transformers. (A.X. 11040.)*

Northern Ireland.—ATHLONE.—September 2nd. Urban District Council. Supply, erection and maintenance for 12 months of three centrifugal water pumps with electric motors and switchgear. (July 24th.)

Nottingham.—August 17th. Water Department. Supply and erection of pumping plant, including electrically-driven multi-stage centrifugal booster pumps and electric motors, in Selston and Normanton-on-the-Wolds. Specifications, &c. (deposit £3 3s.) from Mr. F. W. Davies, engineer and general manager, Water Department, Castle Boulevard, Nottingham.

Panama.—Diesel-electric generating plant developing from 100 to 125 h.p. (G.X. 10521.)*

Rhondda.—August 12th. Urban District Council. Electric lighting and wiring (approximately 174 points) of the Porth County Boys' Intermediate School. Specifications, &c. (deposit £1 1s.) from the Council's electrical engineer, Mr. J. M. Bowman, Electricity Works, Porth, Glam.

South Africa.—JOHANNESBURG.—August 20th. Municipal Council. Electricity meters and time switches. (A.X. 11035.)*

August 29th. 1,000-kW rotary convertor, &c. (A.X. 11047.)*

September 28th. Railways and Harbours Administration. Electric lamps. (A 11051.)*

CAPE TOWN.—September 16th. Oil-immersed capacitor and an automatic oil circuit breaker. (AX 11052.)*

PRETORIA.—September 18th. Town Council. Switchgear and auxiliary apparatus required in connection with the installation of one or, alternatively two, 12,500-kW sets. (A.X. 11037.)*

Southend-on-Sea.—August 19th. Electricity Department. Twelve months' supply of cooking apparatus, domestic water-heating apparatus and domestic washboilers. (July 31st.)

Staffordshire.—August 27th. County Education Committee. Electric lighting and power installations in schools. (July 31st.)

Thorne.—August 22nd. Thorne and District Water Company. Electrically-driven borehole pump. Particulars from the secretary (deposit £3 3s.).

Turkey.—ANKARA.—August 23rd. Administration of Posts, Telegraphs and Telephones. Transformers, convertors, switchgear, &c., for the local wireless transmitting station. (A.X. 11036.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Town Council. Accepted:—
Reconstruction of the Coniston mains.—Johnson & Phillips, Ltd.
Turbine, pipeline, &c. (£1,797).—Gilbert Gilkes & Gordon, Ltd.
Alternators, switchgear, &c. (£850).—Metropolitan-Vickers Electrical Co., Ltd.
Eight feeder pillars.—W. T. Henley's Telegraph Works Co., Ltd.
Link disconnecting boxes and disconnecting fuse boxes.—Siemens Bros. & Co., Ltd.
90-h.p. motor (£130).—Bruce Peebles & Co., Ltd.
Control gear (£43).—George Ellison, Ltd.
Cable.—W. T. Glover & Co., Ltd.
E.h.p. line for supply of electricity to Beckside, Haverthwaite, Newby Bridge, and Lakeside (£3,723).—Johnson and Phillips, Ltd.
Replacement of economisers (£1,606).—Goodbrand & Co., Ltd.

Barnoldswick.—Urban District Council. Accepted:—
Electricity extensions in Manchester Road, Colne Road and the Coates and Long Ing districts.—Pirelli-General Cable Works, Ltd.

Bexhill-on-Sea.—Town Council. Accepted:—
Apparatus for testing a.c. meters (£100).—Edison Swan Electric Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—
Switchgear (£1,984).—Ferguson, Pailin, Ltd.
Switch units (£515).—Metropolitan-Vickers Electrical Co., Ltd.
Rectifiers (£5,759).—Hewittic Electric Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
Boiler feed pump (£120).—Thos. W. Ward, Ltd.

Durham.—County Council. Accepted:—
Installation of electric lighting in schools.—Benfieldside (£415), Sleigh & Wood; Close House (£98), W. Sykes and Sons; Collierley (£206) and Oxhill (£151), Robson and Coleman; Consett (£364), W. L. Tarn; Coundon (£220), R. W. Leek & Co.; Ryhope (£244), F. Reid, Ferens & Co.; West Stanley Front Street (£138), T. W. Atkinson.

Gravesend.—Education Committee. Accepted:—
Installation of electric lighting at Milton Road school (£49).—Lockwood Bros.

Grimsby.—Electricity Committee. Recommended:—
Cables for western extension scheme (£5,856).—Johnson and Phillips, Ltd.

Halifax.—Town Council. Accepted:—
Electric passenger lift at the Bull Green shops and offices (£760).—Etchells, Congden & Muir, Ltd.

Hull.—Water Committee. Accepted:—
Erection of lightning conductors at Dunswell pumping station (£42).—J. W. Gray & Son, Ltd.
Telephones Committee. Recommended:—
Cable (£343).—W. T. Henley's Telegraph Works Co., Ltd.

Lamp Contract.—The Edison Swan Electric Co., Ltd., has received a contract for the supply of lamps for nine months to March 31st, 1932, for the Belfast City tramways.

Leicester.—Electricity Committee. Accepted:—
E.h.p. compound-filled switchgear for central power station (£4,383).—Ferguson, Pailin, Ltd.
Switchgear equipment (£247).—English Electric Co., Ltd.

Liverpool.—Tramways and Electric Power and Lighting Committee. Accepted:—
H.p. and l.p. switchgear for static sub-stations for two years ending June, 1933.—Crompton Parkinson, Ltd.
Tramway junctions.—Titan Trackwork Co., Ltd.
Port Sanitary and Hospitals Committee. Accepted:—
Three electrically-heated water boilers.—Lind & Co.

Middlesex.—County Health Committee. Accepted:—
Two bed lifts at Central Middlesex Hospital (£704).—Wm. Wadsworth & Son, Ltd.

Northern Ireland.—BELFAST.—Electricity Committee. Recommended:—
H.p. armourclad switchgear.—English Electric Co., Ltd.
D.c. switchgear.—Harland Engineering Co., Ltd.
Truck-type switchgear.—Crompton Parkinson, Ltd.
Armourclad switchgear.—A. Reyrolle & Co., Ltd.

Plymouth.—Transport Committee. Accepted:—
Permanent way material (£2,241).—Edgar Allen & Co., Ltd.

Portsmouth.—Borough Education Committee. Accepted:—
Installation of electric lighting at Drayton Road school (£455).—W. Bentley; Penhale school (£226) and Francis Avenue school (£384).—E. Wolfe & Co.

Warrington.—Watch Committee. Accepted:—
Traffic signals (£117).—General Electric Co., Ltd.

Whitwood.—Urban District Council. Accepted:—
Prepayment meter locks.—Lowe & Fletcher, Ltd.
Cable.—Macintosh Cable Co., Ltd.
Poles.—Gabriel Wade and English, Ltd.
Mains, service lines, &c. (Three Lane Ends housing estate).—S. Dixon & Son, Ltd.

Notes

E.D.A. Publications

The following publications have recently been issued by the Electrical Development Association.

E.D.A. 934, "Recommendations in regard to the Design and Construction of Electric Water Heaters." This leaflet may be regarded as supplementary to the report on domestic water heating by electricity.

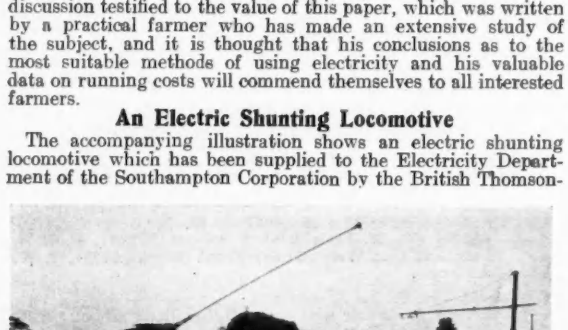
E.D.A. 867, by the E.D.A. Domestic Water Heating and Domestic Appliances Committee. The recommendations call for an amount of uniformity which the Committee is satisfied will in no way restrict the ultimate design or development of water heaters from the manufacturing point of view, but which will definitely tend to reduce installation and service costs. The advantage of uniform dimensions of fixing centres may be instanced, and that these dimensions have already been agreed by the majority of British water-heater manufacturers. The Committee appeals to makers and users to observe the recommendations, so that the water-heating business may be developed in the most rapid and economical manner.

E.D.A. 938, "Electric Heat for Baking." Considerable interest is now being taken in electric baking, and the Industrial Heating Committee of the Association has prepared the above booklet for circulation to bakers and confectioners to incite their interest in the subject.

E.D.A. 969, "Electricity on the Farm, including Dairy and Poultry Farming" is a reprint of the paper read by Mr. M. M. Harvey at the E.D.A. Conference at this year's Royal Agricultural Show. The exceptionally good attendance and discussion testified to the value of this paper, which was written by a practical farmer who has made an extensive study of the subject, and it is thought that his conclusions as to the most suitable methods of using electricity and his valuable data on running costs will commend themselves to all interested farmers.

An Electric Shunting Locomotive

The accompanying illustration shows an electric shunting locomotive which has been supplied to the Electricity Department of the Southampton Corporation by the British Thomson-



Houston Co., Ltd., for hauling coal trucks from the railway sidings to the bunkers at the power station. The haulage capacity of the locomotive ranges from a load of 8 tons at a speed of 18 m.p.h. to a load of 212 tons at 6¾ m.p.h. Its principal dimensions are, approximately, 16 ft. over buffers, 9 ft. wide, 12 ft. overall height, 7 ft. wheel base, and 37½ in. diameter driving wheels. The locomotive is of the four-wheel type and weighs approximately 12 tons, all the weight being available for adhesion. The two traction motors are each of 45 h.p. at 550 volts; there is one centrally-mounted controller of the series-parallel type, and rheostatic braking is available if required. The locomotive conforms in all respects to the load gauge of the Southern Railway, and was built to the specification of the borough electrical engineer, Mr. W. G. Turner, A.M.I.E.E., A.M.I.Mech.E., to whom we are indebted for facilities for reproducing the illustration.

Mining Engineers' Summer Meeting

The summer general meeting of the Institution of Mining Engineers which was postponed from July 8th and the following days, has now been fixed for September 23rd-25th, at Manchester. The programme as originally arranged will be adhered to.

U.S.A. Reconstructs Electric Ships

The United States battleship *New Mexico*, the first large vessel of any navy to be propelled by electricity, is, the *Daily Telegraph* learns, to have her turbo-electric drive replaced by steam turbines. This remarkable decision has been taken on grounds of economy.

While the electric plant is officially stated to have been highly successful, it appears to be costly in operation, and by the change a saving of £60,000 will be effected. Moreover, the horse-power will be increased from 32,000 to 40,000. Two sister ships, the *Mississippi* and *Idaho*, are also to be converted from electric to steam drive, and it may be added that the systematic reconstruction of all its 15 battleships will cost the U.S.A. an average of £2,000,000 per ship.

Aluminium Production in Japan

The Mitsui, Mitsubishi, Sumitomo, and Furukawa interests have recently submitted a plan to the Japanese Government for a subsidy of approximately £500,000 to cover an annual production of 12,000 tons of aluminium by the end of five years. The present retrenchment policy of the Government is holding up the scheme, but the four companies are sufficiently strong to put it into effect when a change in the general situation makes it practicable. Another plan proposed is the erection of a plant at Tsurumi to use power at a low rate from the Daido Electric Power Co. Ore would probably be obtained from France and America. The Korean Nitrogenous Co. has also offered low-rate electric power from its plant on the Kosui River. Its proposal is for the erection of plant to use ore from Northern Chosen, to be reduced by the electrolytic method.

Appointment Vacant

Deputy electrical engineer and manager for Hammersmith Electricity Department.

(See our advertisement pages to-day.)

Women's Engineering Society

The 9th annual conference of this Society will be held at Crosby Hall, Cheyne Walk, S.W.3, from September 25th to 28th, inclusive.

Public Vehicle Batteries

Electric accumulators were included in the exhibits at the special demonstration of public cleansing vehicles that was organised for the Institute of Public Cleansing by the S.M.M.T. at Olympia, London, last month on the occasion of the international conference on public cleansing.

The display of the D.P. Battery Co., Ltd., comprised a selection of "Kathanode" traction and 'bus-type batteries and cell parts, as supplied to the municipal authorities of Ilford, Willesden, Gillingham, Barnsley, Barrow-in-Furness, East Ham, Birmingham, Sheffield, Nottingham, Darlington, Derby, and Hackney.

The exhibits of Edison Storage Battery Distributors, Ltd., were also suitable for municipal electric vehicles, and it is interesting to note that with the placing of a recent order for the seventh Edison battery, the Woolwich Corporation Cleansing Department now has its entire fleet operated by steel-alkaline cells. Attention was directed to the new type of cell, the C-type, which in the same horizontal space occupied by the standard A-type cell has greater capacity because of its greater depth.

A Midland Committee of the E.T.B.I.

At a meeting in Birmingham on July 30th it was decided to establish a centre of the Electrical Trades Benevolent Institution in that city to deal with Institution matters in the Midland area.

E.P.E.A. (Southern Division) Dinner

The Southern Division of the Electrical Power Engineers' Association is holding its annual dinner on September 26th at the King's Hall, Holborn Restaurant, High Holborn, W.C., at 5.30 for 6 p.m. Full particulars can be obtained from Mr. F. H. Smethurst, hon. secretary of the Division, "Normanholme," Hillingdon Road, Gravesend.

Mice . . .!

Messrs. Edwin Crooks & Co.'s experience with a mouse found in an "M.K." switch-plug (see page 186 of our July 31st issue) is confirmed by Messrs. W. J. Cameron and S. Graves, of "Servu," who inform us that they had an exactly similar occurrence some twelve months ago in a private house in the Beckenham district of Kent. They were called in to attend to a radiator plug, which was of an "M.K." flush-type fixed on the skirting, with a box complete, and only a ¾-in. conduit hole entry. On removing the plate a mouse was found firmly fixed across the actual switch contacts, and by all appearances had been killed primarily by electric shock, the action of the switch afterwards only having held its body on the contacts.

A Record Electrical Test

During the present week a notable test has been made in the Metropolitan-Vickers works at Trafford Park, which is believed to constitute a world's record. It consisted in running a turbo-alternator on a wattless-load test of 72,000 kVA. The generator is of the three-phase type, 11,000 volts, and 1,500 r.p.m. The duration of the test was six hours in all, and it was made on the company's test bed for the purpose of confirming calculations and obtaining data for further design. The energy generated during a test under normal full-load conditions would represent a value of over £1,000, but, by loading the machine with wattless current at full voltage, full-load conditions are obtained with a total cost for energy of under £50. This result is obtained by using apparatus constructed by the company for the special purpose of making tests on turbo-alternators. The apparatus consists of two 22,000-kVA reactors, each weighing 45 tons, and in making the present test both were employed, together with two motor-generator sets of 10,000 and 6,000 kVA, respectively, and also with a second generator of 15,000 kVA capacity. Further tests made with the above machine while erected on the test bed consisted of an important series of short-circuit tests on oil circuit breakers. By connecting the machine in either star

or delta, and by utilising special timing arrangements, the circuit breakers opened within one to two half-cycles after the initiation of the short circuit, and currents up to the value of 100,000 amperes have been successfully interrupted. An important feature was the complete data recorded by means of a nine-element oscillograph, showing currents and voltages in all three phases, together with arc-energy, pressure-rise in the circuit-breaker tank, and the complete travel of the cross-bar, during the clearing of the short circuit. The test conditions outlined above approach actual service conditions as nearly as can practicably be obtained.

Japan Tightens Regulations

Stricter control and supervision by the Japanese Government over the nation's electric power industry, as well as easier financial accommodation for electrical enterprises, is provided for by a recently revised law. According to reports to the U.S. Department of Commerce, the revisions of the law provide that the competent authorities may, in the public interest, create, change, or use in common electric power equipment, divert the supply of electricity, and expand or contract the rate of construction work in accordance with the exigencies of a national network of power lines. Enterprises cannot dissolve, suspend, discontinue, or transfer the whole or part of their works or amalgamate with other works without the permission of the competent minister. Enterprises must obtain permission for establishing new or changing the terms of supply. The minister also has the right to withdraw the whole or part of authority granted to electrical enterprises, and may even change the directors of a company in such special cases as are indicated by the law. An electric committee is to be established as a consultative organ to the minister for the proper application of the law.

Low-voltage Fatalities

Mr. Morton G. Lloyd, of the Safety Section of the Bureau of Standards, Washington, D.C., says he has records of 187 instances of fatal accidents which have occurred by contact of the human body with circuits not exceeding 240 volts, and a large majority (70 per cent.) of these have occurred at 110 or 120 volts. More than half of the fatalities occurred in industrial locations and slightly more than one-third in domestic locations; fourteen other cases did not seem to come under either one of these headings. The largest group of industrial fatalities is that resulting from the use of portable lamps and extension cords. This group represents more than a third of the total. Portable appliances attached to extension cords were responsible for fourteen additional fatalities. These usually result from the frame of the portable appliance becoming alive through defective insulation. The appropriate preventive is to ground the frame of the portable appliance or motor. A dozen years ago a list of this kind would have included numerous cases of contact with exposed switches. This hazard has, fortunately, been largely eliminated, so that only three cases below 240 volts were found in these records. The rather common practice of making repairs upon live circuits or handling live parts unnecessarily is responsible for thirteen fatalities. Among the domestic locations the list is headed by the so-called bathtub cases. Most of these involve the use of an electric heater in the bathroom, and inasmuch as we cannot hope to get in domestic installations the special cords recommended for industrial purposes, the best alternative appears to be to keep portable appliances out of the bathroom. Second in number of fatalities are the cases listed as occurring to persons standing in wet basements or upon the ground outside.

Russia's Insufficiency of Power

Soviet Russia's electricity generation under the five-year plan will be 26,000,000,000 kWh in 1933 if the plan becomes accomplishment. In that year the United States figure will be near 134,000,000,000 kWh. With Russia applying one-fifth as much power to supplement labour in production, and that with a larger population, can the Soviet Republic be a formidable industrial competitor of the United States of America? This question is made the focus of Mr. Robert Sibley's *America's Answer to the Russian Challenge*, published by the Farallon Press, says the *Electrical World*. The former dean of engineering at the University of Montana and a delegate to the second World Power Conference puts forth in his book the startling claim that electric power, and all that goes with it, furnishes a yardstick by which the Soviet industrial threat can be measured. "The total generation of electrical energy in Russia during 1913 was 1,925,000,000 kWh," he writes. "By 1928, at the beginning of the five-year plan, this had risen to 5,180,000,000 kWh, and at the end of the five-year period it was estimated to be 26,000,000,000. In America, as far back as 1913, the total electrical energy was 14,000,000,000 kWh; by 1928 this had risen to 77,000,000,000, and at the same rate of increase during the last two years, by 1933 it will rise to the huge total of 134,000,000,000 kWh. Hence, granting that the five-year plan is successful, Soviet Russia will be far, far from overtaking the American programme.

"Again, in the size of units of power development, one hears on all sides in Russia that when the Dnieprostroy is completed Russia will have the largest single hydro-electric generating station in the world. One single river in the United States, the San Joaquin in California, has upon it, already developed, a series of power plant totalling almost 1,000,000 h.p. installed capacity.

"Further than this, it is interesting to note that, according to official statements, the average cost of electric energy in Russian currency per kilowatt-hour in 1933, when her vast economic programme will be completed, will be (at the consumers' end of the line) about 1.75 cents per kilowatt-hour. This allows nothing for taxes, because the entire project is Government owned. On the other hand, there was delivered last year to 49,067 farms of California 956,000,000 kWh at a cost of only 1.41 cents per kilowatt-hour, even when State and Federal taxes, amounting to almost 10 per cent. of the sale price, had been paid by the companies.

"If the ultimate and final awakening of Soviet Russia is ever brought about," Mr. Sibley writes, "she will find herself as a nation possibly still calling herself Soviet Russia, but to all intents and purposes American to the core in education, in ideals of homes and, above all, in the burning desire to press forward under the undying urge of the highest type of individual initiative. Whether Russia can ever succeed in this way may be problematical; that she can succeed in no other way is certain."

Magnetic Separation of Iron from Refuse

When the first International Conference on Public Cleansing deliberated at Olympia, London, last month, Mr. James Jackson, general manager of the Salvage Department, Birmingham, according to the *Financial Times*, read a paper on "The Scientific Treatment and Utilisation of Town Refuse." Mr. J. C. Dawes presided. After describing the process of incineration in Birmingham, the automatic and dustless working of which always fascinated visitors, Mr. Jackson said that if refuse destructor works in general were to come up to the ideal desired by the president, there must be a constant and sustained effort to raise them to such a standard of efficiency as not to be nuisance whatever to a neighbourhood, and fit and proper places in which men could earn their livelihood, equal in all respects to the best workshop practice. The application of magnetic separation for the automatic removal of the iron content of house refuse with the dual object of securing the iron as a saleable commodity, and by its abstraction improving the final clinker product, was a development which was playing a material part in the efficiency of their plants. He was confident that the future would hold many fresh applications of magnetism to their particular work in the handling and loading of heavy magnetic material. One form of it he had recently adopted was for the removal of iron from the fertiliser and feeding stuffs produced. This had decreased wear of disintegrating machines and eliminated risk of fire. Refuse disposal offered a field for scientific exploration. His own laboratory staff was constantly engaged upon analytical work in connection with plant control and the sale of products, analysis of incoming material used in the work of the department, and research work. As a result, the plant was run on the most economic basis, and fresh processes were put into operation.

Industrial Arts Competition

In connection with the eighth annual competition of industrial designs held this year by the Royal Society of Arts, there were two items of electrical interest. Prizes of fifteen and ten guineas were awarded by the General Electric Co., Ltd., for designs of lighting fittings for a lounge in a private house. Generally speaking, competitors lost sight of the fact that the lighting units were to have formed the basis of the decorative treatment of the room, and little consideration was given in most cases to cost. Hailwood & Ackroyd, Ltd., awarded ten guineas for a design for a ceiling electric light fitting suitable for a kinema entrance. Designs were submitted with moulded glass panels which showed no conception of the cost of moulds that would not be recovered by sales, while others would necessitate structural alterations to ceilings.

Co-operation in Electrical Precipitation

The tendency towards world-wide co-operation in engineering activities has lately manifested itself within the field of the electrical cleaning of gases and air. This art has been developed by highly-specialised organisations in various countries, and up till now only a loose co-operation has existed between some of them, while others were outside. In America the International Precipitation Co. and the Research Corporation made great strides in the art, and they had always a very clear conception of the necessity for exchanging experience with operators in other countries. On the Continent of Europe the Lurgi Apparatebau Gesellschaft and the Siemens-Schuckertwerke gradually acquired the whole of the field, whereas Messrs. Lodge-Cottrell, Ltd., have operated inside the British Empire, developing the art on the basis of the original ideas and patents of Sir Oliver Lodge. As a result of recent negotiations, an agreement has been entered into between all the above-mentioned concerns whereby they have resolved to exchange all patents and experience and to support each other in every way.

The Schneider Race

The crowds that are expected to watch the forthcoming seaplane contest for the Schneider Trophy will be kept informed of the progress of the racing by means of loud-speakers supplied and operated by Standard Telephones & Cables, Ltd. A running description will be broadcast from Ryde Pier through the B.B.C. Daventry radio station, which will be picked up by wireless receivers at various vantage points around the course and then relayed to the crowds through loud-speakers.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. C. Adams recently completed forty years' service with the Kensington and Knightsbridge Electric Lighting Co., Ltd., and to mark the occasion the directors presented him with a canteen of cutlery. The presentation was made by Mr. G. C. Weston, the chief engineer of the company.

Mr. H. E. Blackiston, A.M.I.E.E., who has been appointed borough electrical engineer of Ipswich

Mr. H. E. Blackiston is leaving West Hartlepool to take up the appointment of borough electrical engineer of Ipswich. Mr. Blackiston succeeded Mr. J. H. Parker as borough electrical engineer and transport manager of West Hartlepool in January last year. Prior to that he was deputy chief in the Bermondsey undertaking. After serving as a pupil at Horsham (Surrey) and in various capacities at Penarth and Nuneaton and with the Cleveland and Durham Electric Power Co., he became district engineer for a large part of the South Wales Electric Power Company's system. In 1919 he came to London as sub-station superintendent to the L.C.C. Tramways, relinquishing that position in 1928 to join the Bermondsey undertaking.

Mr. Samuel Tillotson, who is at present mains engineer at West Hartlepool, has been appointed to succeed Mr. Blackiston as borough electrical engineer at a commencing salary of £700 per annum, rising by three annual increments to £850 per annum. It is proposed to separate the duties of the electrical engineer and transport manager, and the question of the appointment of a transport manager is to be considered by the Town Council next month. When Mr. Tillotson's appointment came before the Council last week, considerable discussion arose. It was contended by some members that the position should have been advertised and the merits of all applicants given equal consideration. Others protested against the departure from the accepted salary scale for the post. Mr. Blackiston's commencing salary was £1,125 per annum with an additional £150 for his services as transport manager.

Mr. W. A. Crowther has been appointed to the vacancy on the board of the Yorkshire Electric Power Co., caused by the death of Mr. E. R. Benson.

Mr. E. A. Mills, who was appointed borough electrical engineer of Halifax in April last, was the guest of honour at a dinner arranged by the Halifax Circle of the British Electrical Development Association on July 24th. The object of the function was to welcome Mr. Mills to the town and to assure him of the support of all local sections of the industry.

Mr. H. A. Tulloch, the electrical engineer and manager of the Leek (Staffs.) electricity undertaking, was recently recommended for an increase of salary from £550 to £600 per annum with a further rise of £50 as from July 31st, 1932. The recommendation led to considerable discussion at last week's meeting of the Urban District Council. It was urged against the proposal that Mr. Tulloch received £100 per annum from the Joint Electricity Authority, but the chairman of the Lighting Committee said that the correct salary should be £790 according to the I.M.E.A. scale. The recommendation was eventually carried.

Mr. W. I. Place, M.Sc., of Dartford Technical College, has been appointed responsible lecturer in electrical engineering at the Technical College, Chesterfield.

The Council of the University of Sheffield has decided to appoint a Professor of Electrical Engineering. It is hoped to make the appointment in time for the professor to take over his duties in the early part of 1932.

Mr. A. J. Ryan, borough electrical engineer of Hastings, has been placed on the salary scale for chief engineers of municipal undertakings. His present salary will be increased from £1,000 to £1,215 per annum.

Mr. J. Savage, the deputy borough electrical engineer, has had his maximum salary increased from £700 to £750 by two annual increments of £25.

Mr. D. Marshall is recommended by the Southwark Electricity Committee for the appointment of mains superintendent at a salary of £360 per annum.

Mr. H. L. Adams, of West Ham, late of Croydon, has been appointed mains superintendent by the Heston and Isleworth Urban District Council. He takes up his duties on August 17th.

Mr. R. Sidney, manager at Bradford-on-Avon for the Western Electric Light and Power Co., has been appointed manager for the company at Abingdon, and is succeeded at Bradford by Mr. Allsopp.

Mr. Thomas A. Edison, according to reports from the United States, is suffering from a complete breakdown in health and is lying dangerously ill at his home, West Orange, New Jersey. Mr. Edison is now 84 years of age and has been in declining health for some months past. His vast host of electrical friends and admirers in all parts of the world will sympathise with Mr. Edison in his time of weakness and earnestly hope that he may recover his former health and vigour.

In our last issue we illustrated the portrait and album presented to **Mr. Theodor Petersen** to mark his appointment as assistant managing director of Callender's and the Anchor Cable Co. The luncheon at which the presentation was made was presided over by Mr. George Barnard, who celebrates his jubilee with Callender's in a few months' time. The gathering included many others who have been with the company for long periods. The secretary of Callender's, Mr. Howard Foulds, acted as master of ceremonies.

We are asked to say that the statement made here last week regarding **Mr. G. W. Malcolm** was incorrect. He has been appointed a director (not *chairman*) of the North Wales Power Co. and the British Power and Light Corporation (1929), Ltd. Mr. G. V. Twiss is chairman of the former company and Mr. H. A. Vernet chairman of the latter.

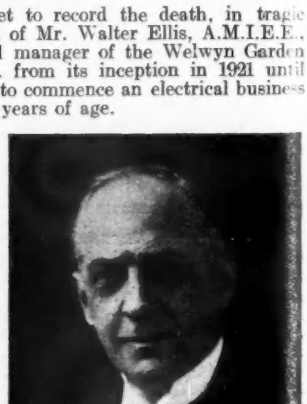
Obituary

Mr. R. C. Clinker.—We greatly regret to report the death of Mr. Reginald Charles Clinker, chief research engineer of the British Thomson-Houston Co., Ltd., Rugby. He was climbing in the North Wales mountains on Monday last when he slipped and fell a distance of 200 ft. on to some rocks. His companions reached him with the aid of ropes and found him very seriously injured and unconscious. He could not be moved without assistance and it took a party four hours to reach him; he died at the moment of their arrival. At an inquest held at Dolgarrog on Tuesday a verdict of "Accidental death" was returned. Mr. Clinker was 57 years of age.

Mr. J. Smith.—The death occurred on July 28th of Mr. James Smith, gas and electrical engineer to the Colwyn Bay Urban Council. Mr. Smith was appointed gas manager in 1910 and when the position of electrical engineer fell vacant during the war he added the duties of that post to his other work. He negotiated a bulk supply agreement with the North Wales Power Co., and since 1918, when he took over the electricity undertaking, the number of consumers has risen from 888 to nearly 4,000 and the sale of energy from 314,000 to 2,260,000 kWh per annum.

Mr. W. Ellis.—We regret to record the death, in tragic circumstances on July 27th, of Mr. Walter Ellis, A.M.I.E.E., who was chief engineer and manager of the Welwyn Garden City Electricity Supply Co. from its inception in 1921 until February last, when he left to commence an electrical business in partnership. He was 36 years of age.

Mr. H. N. Prentice.—We learn with deep regret of the death of Mr. Herbert Napier Prentice, M.I.E.E., M.I.P.Tech., which occurred on July 30th at Hylands, Little Coggleshall, Essex, at the age of 65 years. Mr. Prentice was connected with electrical engineering and electricity supply matters from their early days. After his engineering training, he joined Paris and Scott, electrical engineers at Norwich, as designer and draughtsman; electrical manufacturing at Stowmarket and the foundation of the Suffolk Electricity Supply Co., Ltd. (now the East Anglian Electricity, Ltd.) were among his varied other interests. He established the Suffolk Co. at Stowmarket in 1896, at Diss in 1898, and at Felixstowe in 1900. His early experiences included a visit to the Frankfort Exhibition in 1891; work at the Crystal Palace Exhibition in 1892; a visit to the U.S.A. followed by the production of dynamos at Stowmarket, and the introduction of electric light and power, in partnership, at the last-named town in 1896. He was at one time interested in electric cooker design and was responsible for a novel arrangement by which the oven elements could be closed up to form a double grill. Examples of this were shown at the 1925 British Empire Exhibition. He was one of the founders of the Diesel Users' Association, and also one of its presidents. The funeral took place on Saturday afternoon, a service being held at the Stowmarket Congregational Church.



The late Mr. H. N. Prentice (*Photograph by Elliott & Fry, Ltd.*)

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

J. G. Statter & Co., Ltd.—Private company. Registered July 29th. Capital, £30,000 in £1 shares (10,000 7½ per cent. cumulative redeemable preference and 20,000 ordinary). Objects: To acquire the business of engineers, electricians and general contractors carried on by J. G. Statter and G. S. Marston, at 16, Great George Street, Westminster, and elsewhere. The permanent joint managing directors are: J. G. Statter (chairman), 27, Westminster Mansions, Great Smith Street, Westminster, S.W.; G. S. Marston, Burton's Lane, Chalfont St. Giles, Bucks. Registered office: 16, Great George Street, Westminster, S.W.

Ringmer & District Electricity Co., Ltd.—Registered as a public company July 30th. Capital, £10,000 in £1 shares. Objects: To carry on the business of an electric light and power supply company in all its branches. The first directors are: G. L. Wates, Rowhill Grange, Wilmington, near Dartford (chairman of, Johnson & Phillips, Ltd.); H. J. Sheppard, Lamorbey Park, Sidcup, Kent (managing director and secretary of Johnson and Phillips, Ltd.); C. Stewart, "Blantyre," Beaconsfield Road, Blackheath, S.E.3 (director of Johnson & Phillips, Ltd.). Secretary: W. W. Redman. Registered office: Columbia House, Aldwych, W.C.2.

Portland Products, Ltd.—Private company. Registered July 28th. Capital, £25,000 in £1 shares (12,500 8 per cent. cumulative participating preference and 12,500 ordinary). Objects: To carry on the business of manufacturers of and dealers in and importers or exporters of vacuum cleaners and sweepers and accessories, electrical engineers and contractors, manufacturers of and dealers in radio and household appliances, &c. The subscribers are: J. A. Caldwell, Elmdene, Pinner, and three others. Solicitor: P. W. Bullock, 7, Stone Buildings, Lincoln's Inn, W.C.2.

Home Electric, Ltd.—Private company. Registered July 30th. Capital, £100 in £1 shares. Objects: To carry on in England or elsewhere the business of electrical engineers and contractors, manufacturers of and suppliers of all kinds of electrical and wireless apparatus, &c. The directors are: A. H. Kaye (managing director), Dalkeith, Upper Park Road, Kingston Hill; W. Bennison, 9, York Mansions, Earl's Court, S.W.5; E. S. Samson, 5, Dukes Lane Mansions, W.8; Rhoda M. King, 164, Muswell Hill Road, N.10. The last three named are directors of B. & S. Electrical Co., Ltd. Secretary: Rhoda M. King. Registered office: 24, Sackville Street, W.1.

Barnstaple Loud Speaker Co., Ltd.—Private company. Registered July 29th. £1,250 in 1,000 100 per cent. cumulative preference shares of £1 and 5,000 deferred shares of 1s. each. Objects: To carry on the business of manufacturers of loud speakers, radio sets, gramophones, &c. The directors are: A. N. Oliver (chairman), "Rosebank," Barnstaple, Devon; J. N. Oliver, Summerfield, Ashford, Devon; M. Trouton, Dadbrook, Cuddington, near Aylesbury, Bucks.; R. de Burgh Trouton, 28, Gordon Square, W.C.1. Secretary: W. J. Carroll. Solicitors: Pitts Tuckers, Bridge Chambers, Barnstaple.

Radio Wholesalers, Ltd.—Private company. Registered in Edinburgh on July 28th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, and dealers in radio apparatus, &c. The directors are: S. Levine and Mrs. Gertrude Levine, both of 18, St. Andrew's Drive, Pollokshields, Glasgow. Registered office: 45, Renfield Street, Glasgow.

William Patchett & Co., Ltd.—Private company. Registered July 28th. Capital, £500 in £1 shares. Objects: To acquire the business of a manufacturer of the "Patchett" magneto, coil ignition and plug tester under provisional patent No. 5,347/31, carried on by W. Patchett, at 14, Prince Albert Street and also at Bradley Street, off Henshaw Street, Oldham, and to carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, &c. The permanent directors are: W. Patchett, 14, Prince Albert Street, Oldham; A. E. Smith, and E. C. Smith, both of "Hillroyd," Carr Road, Greenfield; J. McCarthy, 18, Villa Road, Oldham. Solicitors: A. E. Grundy, 2, John Dalton Street, Manchester.

Tyrela Radio, Ltd.—Private company. Registered July 29th. Capital, £100 in £1 shares. Objects: To acquire the right to use jointly with Tyrela Gramophones, Ltd., the registered trade mark "Tyrela," and to carry on the business of manufacturers, importers and exporters of and dealers in radio, television and telephone apparatus, &c. The subscribers are: B. E. J. Tyler, 12a, Electric Parade, South Woodford, Essex; S. A. Wood, 5, Buckingham Road, South Woodford, E.18. B. E. J. Tyler is permanent managing director and chairman. Registered office: 21, East Road, City Road, Hoxton, N.1.

Devon Electric & General Services, Ltd.—Private company. Registered July 29th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electrical apparatus, &c. The subscribers are: F. A. S. Gwatkin, and D. I. Wilson, 31/4, Basinghall Street, E.C.2, solicitors. Solicitors: McKenna & Co., 31/4, Basinghall Street, E.C.2.

J. H. Weedon & Co., Ltd.—Private company. Registered July 29th. Capital, £100 in £1 shares. Objects: To carry on the business of producers and sellers of radio goods carried on by J. H. Weedon, at 26a, Lisle Street, W.C.2, as "J. H. Weedon and Co." The permanent directors are: A. C. Hayes, "Glenmornan," Manor Gardens, Guildford, Surrey; A. W. Hodges, 3, Palace Mansions, Muswell Hill, N.10, company director; J. H. Weedon, address not stated. Secretary: A. C. Hayes. Registered office: 26a, Lisle Street, Leicester Square, W.C.2.

Andover and District Wireless Relay Co., Ltd.—Private company. Registered July 31st. Capital, £500 in £1 shares. Objects: To carry on the business of relaying or distributing British and foreign wireless programmes, &c. The permanent directors are: C. E. Dodd, Bridge Street, Andover, wireless engineer, and L. H. Kendall, 8, High Street, Andover.

Lumeta Products, Ltd.—Private company. Registered in Edinburgh on July 23rd. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric and gas lamp shades, &c. The directors are: G. L. Innes, 1, St. Bernards Crescent, Edinburgh, electrical engineer; J. Finlay, 12, Comely Bank Terrace, Edinburgh. Registered office: 37, Chambers Street, Edinburgh.

Great Eastern Radio, Ltd.—Private company. Registered July 27th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of wireless goods, radio-gramophones, electrical instruments, switchboards, mouldings, &c. The first directors are: S. Godfrey, 37, West Bank, N.16, radio dealer; M. M. Sadie, 8, Preston Road, Wembley Park. Registered office: 183, Old Street, E.C.1.

Returns of Electrical Companies

South Metropolitan Electric Light & Power Co., Ltd.—Particulars filed of £500,000 debenture stock authorised May 29th, 1931, and covered by trust deed dated July 1st, 1931, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. Trustees: Brig. General Sir Arthur Maxwell, and F. C. Tiarks. (The issue price is 93 per cent. less one half of 1 per cent. commission.)

Watkins and Doncaster (Service), Ltd.—Debenture dated July 21st, to secure £440, and further advances not exceeding therewith £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. J. C. Smith, 65, New Bond Street, W.1.

V. G. Engineering, Ltd.—Particulars filed of £2,000 debentures authorised July 7th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Hadden & Pearce, Ltd.—S. H. Gillett, of 24, Basinghall Street, E.C.2, ceased to act as receiver and manager on July 24th.

Precision Engineering Co., Ltd.—H. Wingfield, of 67, Watling Street, E.C.4, ceased to act as receiver and manager on July 21st, 1931.

R. Becker & Co., Ltd.—D. C. Lynch, of 51, Woodford Road, Forest Gate, E.7, was appointed receiver on July 22nd, under powers contained in debenture dated February 3rd, 1931.

Charles White Electrical Co., Ltd.—Capital, £3,000 in 2,000 "A" and 1,000 "B" shares of £1 each. Return dated March 5th, 1931. 1,550 "A" and 1,000 "B" shares taken up. £1,050 paid. £1,500 considered as paid. Mortgages and charges, nil.

Sherborne Electric Supply Co., Ltd.—Capital, £15,000 in £1 shares. Return dated May 4th, 1931. All shares taken up. £15,000 paid. Mortgages and charges, nil.

City of Buenos Ayres Tramways Company (1904), Ltd.—Capital, £1,240,000 in £5 shares. Return dated March 2nd, 1931. All shares taken up. £1,240,000 considered as paid. Mortgages and charges: £152,708.

Isle of Thanet Electric Supply Co., Ltd.—Capital, £500,000 in 282,000 6 per cent. preference, 150,000 ordinary and 68,000 unclassified shares of £1. Return dated March 25th, 1931. All preference and ordinary shares taken up. £222,000 paid on the preference shares. £210,000 considered as paid on 60,000 preference and 150,000 ordinary shares. Mortgages and charges: £277,396.

Fuller Accumulator Co. (1926), Ltd.—Capital, £54,000 in 50,000 "A" ordinary and 4,000 "B" ordinary shares of £1. Return dated April 14th, 1931. 47,500 "A" and 4,000 "B" shares taken up. £51,500 paid. Mortgages and charges, nil.

Cary-Hallewell & Co., Ltd.—Capital, £2,500 in £1 shares. Return dated February 13th, 1931. 1,250 shares taken up. £1,250 paid. Mortgages and charges: £200.

H. T. C. Electrical Co., Ltd.—Capital, £2,500 in £1 shares. Return dated December 24th, 1930 (filed April 1st, 1931). 2,500 shares taken up. £950 paid. £1,550 considered as paid. Mortgages and charges, nil.

Seaton & District Electric Light Co., Ltd.—Capital, £10,000 in £1 shares. Return dated March 28th, 1931. All shares taken up. £10,000 paid. Mortgages and charges: £5,600.

Northern Counties Electricity Supply Co., Ltd.—Satisfaction (1) on various dates between June 26th, 1924, and July 1st, 1931, of debenture stock secured by trust deed dated July 14th, 1905, and supplemental trust deeds dated July 6th, 1927, and July 31st, 1928, and registered August 1st, 1905, July 15th, 1927, and August 13th, 1928, respectively, securing £100,000, and (2) to the extent of £90,000 (being amount issued) on July 1st, 1931, of second debenture stock secured by trust deed dated December 11th, 1907, and registered December 23rd, 1907, securing £100,000.

Westminster Electric Supply Corporation, Ltd.—Capital, £2,000,000 in 550,000 4½ per cent. cumulative preference and 1,450,000 ordinary shares of £1. Return dated March 10th, 1931. 550,000 preference and 1,259,366 ordinary shares taken up. £1,305,620 paid on 550,000 preference and 755,620 ordinary shares, £503,746 considered as paid on 503,746 ordinary shares. Mortgages and charges, nil.

Gent & Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. Return dated March 11th, 1931. 7,427 preference and 24,376 ordinary shares taken up. £13,387 paid on 3,957 preference and 9,430 ordinary shares. £18,416 considered as paid on 3,470 preference and 14,946 ordinary shares. Mortgages and charges: £9,000.

South Metropolitan Electric Tramways & Lighting Co., Ltd.—Capital, £600,000 in 200,000 preference and 400,000 ordinary shares of £1. Return dated March 12th, 1931. All shares taken

up. £565,110 paid on 200,000 preference and 365,110 ordinary shares. £34,890 considered as paid on 34,890 ordinary shares. Mortgages and charges: £128,291.

Midland Electric Manufacturing Co., Ltd.—Capital, £187,500 in 75,000 preference and 112,500 ordinary shares of £1. Return dated March 10th, 1931. All shares taken up. £85,000 paid on 25,000 preference and 60,000 ordinary shares, £102,500 considered as paid on 50,000 preference and 52,500 ordinary shares. Mortgages and charges, nil.

Urban Electric Supply Co., Ltd.—Satisfaction in full on June 17th, 1931, of trust deed dated July 27th, 1923, and registered July 31st, 1923, securing mortgage debenture stock. (According to the register of mortgages, the trust deed registered July 31st, 1923, originally secured £350,000).

Burnham and District Electric Supply Co., Ltd.—Satisfaction to the extent of £1,000 on July 7th, 1931, of debenture dated March 2nd, 1920, and registered March 10th, 1920. (According to the register of mortgages, the debenture registered March 10th, 1920, originally secured £3,000).

Sloan Electrical Co., Ltd.—Capital, £60,000 in 10,000 preference and 50,000 ordinary shares of £1 each. Return dated June 20th, 1930 (filed March 27th, 1931). 8,000 preference and 40,000 ordinary shares taken up. £41,500 paid, £6,500 considered as paid. Mortgages and charges, nil.

Norwood Radio, Ltd.—Debenture dated July 17th, 1931, to secure £150, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: T. M. Barbour, 366, Brixton Road, S.W.

Spa Electrical Specialities, Ltd.—Particulars filed of £500 debentures authorised July 18th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Chesham Electric Light & Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated March 10th, 1931. 165,000 shares taken up. £144,998 paid. £20,002 considered as paid. Mortgages and charges, nil.

Armature & Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 10th (filed May 22nd), 1931. 800 shares taken up. £750 paid (being £1 on 600 and 15s. on 200 shares). Mortgages and charges, nil.

Harrow Electric Light & Power Co., Ltd.—Capital, £50,000 in 3,333 preference and 6,667 ordinary shares of £5 each. Return dated March 12th, 1931. All shares taken up. £50,000 paid. Mortgages and charges: £25,000 debentures.

Childs Electrical Stores, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1930 (filed April 30th, 1931). All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: £502 15s.

Radio Retailers, Ltd.—Particulars filed of £1,000 debentures (second series) authorised July 14th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

H. J. Cash & Co., Ltd.—Capital, £25,000 in £1 shares. Return dated March 10th, 1931. 15,650 shares taken up. £10,650 paid. £5,000 considered as paid. Mortgages and charges, nil.

North Metropolitan Power Station Co., Ltd.—Capital, £100 in £1 shares. Return dated March 10th, 1931. All shares taken up. £100 paid. Mortgages and charges: £1,684,500.

Power & Lighting Cables, Ltd.—Capital, £10,000 in £1 shares. Return dated March 11th, 1931. 1,100 shares taken up. £1,100 paid. Mortgages and charges, nil.

Rochdale Community Radio, Ltd.—Mortgage for £456 11s. 11d. dated February 18th, 1927, charged on 345 and 347, Halifax Road, Rochdale (being property acquired by the company on March 30th, 1931). Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: Halifax Building Society.

S. Evans & Sons, Ltd.—Deposit on July 6th, 1931, of deeds of 16a and 18, King Street, Maidenhead, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Sandycroft, Ltd.—Satisfaction to the extent of £28,000 on July 14th, 1931, of debentures authorised August 3rd, 1911, and registered October 17th, 1911, securing £40,000.

Wessex Electrical Supplies, Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th (filed May 15th, 1931). 172 shares taken up. £172 paid. Mortgages and charges, nil.

Wilfred Frances & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 27th, 1931. 490 shares taken up. £490 paid. Mortgages and charges, nil.

City Notes

Cables & Wireless, Ltd.

The accounts of this company were abstracted in our last issue, p. 189, and the annual meeting was held on July 30th. Mr. J. C. Denison-Pender (governor and managing director) who presided, said in the course of his speech, that they found that the statistics of all industries showed a steady and continued decline. It was not surprising, therefore, that the telegraphic business of the world, which was so closely dependent on the activity of trade and industry, should show disappointing results. For the first six months of the current year the traffic receipts of the Communications Co. had fallen by over £500,000, and the full interim dividend upon the 5½ per cent. preference stock had obviously not been earned. Under the circumstances the directors had no alternative but to await the financial result for the year before committing themselves to any payment on account of the preference dividend of the year. The main disability from which they were suffering was the failure of the Communications Co.—the telegraphic side of the business—to earn the substantial profits which the combined undertakings were earning at the time the merger was consummated. The disappointing result was due to two causes—trade conditions and the establishment of direct wireless services between one country and another, which absorbed traffic previously transmitted over the lines of those companies. On the first sign of trade revival, however, there would be an immediate improvement in the traffics of the undertaking. They were not isolated in their position as regarded communications. All telegraph communication interests, including the Great Northern Telegraph Co. of Denmark, and the American companies, were experiencing like difficulties, and the alleviation of those difficulties and the future success of the telegraph communications of the world could best be attained by co-operation, not by competition. Considerable economies had been effected by the Communications Co., including a reduction in the staff with a consequent saving in commitments of nearly £400,000 per annum, a reduction in the number of ships, which would produce a further saving of nearly £100,000 per annum. Certain cables in Portuguese East Africa where they were able to give a satisfactory wireless service, had been closed, and they had under contemplation the removal of certain other cables to suitable places which would relieve them of heavy transit taxes. Much was being done in research, and in the development of new services, which although unremunerative at the moment, were only awaiting the revival of trade in order either to produce additional revenue or to protect the existing communications. Tests with the cable regenerator on the London-South Africa wireless circuit, which had been in progress during the past month, had been successful, and they were confident that it would shortly be possible to put this apparatus into operation for actual traffic. This meant that the present manual typing of received wireless signals would be superseded by instruments that would automatically produce a printed message, and apart from diminishing the possibility of error it would effect a reduction in the staff required. By a drastic and far-reaching policy of economy they had done much to temper the severity of the effect of trade depression without damaging the structure or efficiency of the undertaking. As a result of consultations with the Advisory Committee (on which were represented the Governments of the United Kingdom, Canada, Australia, New Zealand, South Africa, the Irish Free State and India), a committee of inquiry had been appointed consisting of the following: Mr. Wilfred Greene, K.C. (chairman), Lord Ashfield, and Mr. Lawrence Durning Holt. This committee had been set up "to inquire into the position of Imperial and International Communications, Ltd., and all matters related thereto and bearing thereon, including the causes and consequences of the great discrepancy between the standard revenue and the present earnings, and to suggest measures which will remedy the present situation." The report and accounts were adopted.

Marconi's Wireless Telegraph Co., Ltd.

The annual meeting was held on July 29th, Lord Inverforth (chairman) presiding. In presenting the report and accounts (ELEC. REV., July 24th, p. 153), he said that the main cause of the decrease of profit was the reduction of £176,471 in dividends received from Imperial & International Communications, Ltd. Judging by the present position of orders received since the beginning of the current year, the sales effected in 1931 were likely to exceed the orders booked during the record year of 1929. The results of this business, however, would not be evident in the profit and loss account for 1931, but would be deferred to a later date. Also, owing to the fierce competition for world business they were compelled to accept a smaller margin of profit than used to be secured. They continued to maintain the lead in the construction of high-power broadcasting stations and they had just completed the large contract for the Polish Broadcasting Corporation, of which the main feature was the erection in Warsaw of the most powerful broadcasting station in Europe. Poland was now covered, in the broadcasting sense, by a network of Marconi stations, which enabled listeners in all parts of the country, covering an area of 150,000 sq. miles, to listen to their national programmes with comparatively cheap sets. Other broadcasting stations had been erected in Italy, Switzerland, Sweden, Finland and Iceland, in addition to the two new British regional stations supplied to the B.B.C. Another recent notable achievement was the opening of the wireless stations supplied to and erected for his Holiness the Pope within the boundaries of the Vatican State. Wireless apparatus was fitted on all Imperial Airways passenger machines; aircraft flying on the African and Indian air routes had been fitted with Marconi apparatus; and they had established aerodrome ground stations along the African air route. Wireless telephone apparatus had been installed in the *Empress of Britain* and the *Homeric*. During 1930 they exported wireless apparatus of various types to over 46 different countries throughout the world. In many of these markets competition was very keen, but it was satisfactory to be able to record that they were not only maintaining their ground, but were also making satisfactory progress, of which they had reason to expect to reap the full results when the present period of world depression came to an end. The report and accounts were adopted.

Venezuela Telephone Co.

The annual meeting of the Venezuela Telephone and Electrical Appliances Co., Ltd., took place last Friday. Sir Alexander Roger, the chairman, presided, and in presenting the report (ELEC. REV., July 24th, p. 153) briefly mentioned

the reorganisation proposals and surveyed the company's general position. He said that the development programme had made good progress. The scheme for the conversion of the more important exchanges in Venezuela to automatic working was well under way and five of them had already been changed over. Although the Venezuelan exchange had been affected by the world depression, the inherent stability of the country would enable it to respond readily to trade recovery. Referring to world conditions, he maintained that selfish nationalism and artificial barriers must go and all must bend their energies in the common cause of world stability and economy. The company was exercising economy but not at the expense of efficiency. The report of one of the directors who had recently visited Venezuela showed that the public was well satisfied with the company's service. The report was adopted and subsequently extraordinary meetings of shareholders approved the reorganisation scheme. Under this, the present company will be liquidated, and Mr. Gordon Forbes, the liquidator, will register a new company—Telephone Properties, Ltd.—with a registered capital of £900,000 in 450,000 8 per cent. cumulative preference shares and 450,000 ordinary shares of £1 each. The preference shareholders of the existing company will receive four new preference and two new ordinary shares for each four preference shares now held; the ordinary shareholders will receive five new ordinary shares for each four ordinary and/or "A" ordinary shares in the existing company.

Electrical Distribution of Yorkshire, Ltd.

The directors report a substantial increase in sales of energy during the first half of the current year. The interim dividend is maintained at 4½ per cent. In March last 100,000 shares at 26s. each were offered to the shareholders and the issue was applied for more than five times over. The Wharfedale Special Order has been confirmed by Parliament. This empowers the company to supply electricity in parts of the Otley urban district and the rural district of Wharfedale. This addition increases the company's area of supply to 1,238 sq. miles.

W. & T. Avery, Ltd.

In the course of his speech at the annual meeting on July 28th, Sir J. Fortescue Flannery (chairman), in referring to general trade conditions, said that the prices of commodities in every sphere had been steadily dropping until in important and basic industries, they were in many cases below the cost of production. In the circumstances it could not be expected that the company, which supplied all producers of commodities, should not have experienced conditions and difficulties which it had never had to face before. Their position at home had been well maintained. Regarding their position abroad, dependent as it was upon such markets as Sudan and Australia, while it had been so improved that a bigger goodwill than ever had been established, it had been difficult, owing to political and economical disturbances, and to the position of the great primary producers. None the less, important economies in their administration, and, through the co-operation of their operatives, in their production costs, had been effected during the year.

Parkinson & Cowan, Ltd.

Presiding at the recent annual meeting, Sir Henry Cowan (chairman) said, in the course of his speech, that Measurement, Ltd., continued to effect satisfactory sales, and had secured important contracts, but it was not yet working to maximum capacity. The business of Domestic Electrification, Ltd., had not increased during the year to the extent the directors had anticipated, and the overhead charges of this subsidiary were necessarily heavy in relation to output. It products were, however, recognised as being of such high quality as to justify the belief that, as they became more widely known, sales would steadily increase.

Companies to be Struck Off the Register

The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—

Auto-Electric Advertising Co., Ltd.
Bath Electrics, Ltd.
County Areas Electricity Co., Ltd.
Domestic Electric Generators, Ltd.
Electrovite, Ltd.
Freed-Eisemann Radio of Great Britain, Ltd.
Jury's Electric Service, Ltd.
Portable Accumulators, Ltd.
Quality Radio, Ltd.
Radiocoil Electro-Magnetic Blanket, Ltd.
Thanet Electric Factors, Ltd.
Wireless Battery, Motor and Electric Lighting Co., Ltd.

Nigerian Electricity Supply Corporation, Ltd.

The annual meeting was held on July 31st, the Hon. Lionel Holland (chairman) presiding. In presenting the report and accounts (Elec. Rev., July 31st, p. 190), the chairman said their revenue was secured by long-term contracts under which the tin-mining companies engaged to take stated deliveries of power at a fixed price per kWh, but in view of the altered conditions, as the result of the slump in the price of tin, reductions had been made in the charges, which were equivalent to a revenue of over £26,000 per annum. The power house was equipped with three 2,000 h.p. sets, but the plan for the enlargement of the undertaking by the addition of a 6,000 h.p. set had been postponed in view of the parlous condition of the tin industry. Recently, however, there had been encouraging signs of an improvement in the prospects of the industry, and it seemed fairly certain that the trend of the price of the metal must be to improve, unless there was another and further setback in trade. The report and accounts were adopted.

The Constantinople Telephone Co., according to the *Financial Times*, is to hold an extra-ordinary general meeting on August 13th in order to take note of the decision of the Board to increase the paid-up share capital by £50,000 under Article 6, and to consider the Board's proposal that the present shareholders renounce their right to subscribe to the shares to be issued in consequence. The issued capital is £250,000 out of £450,000 authorised.

The City of London Electric Lighting Co., Ltd., has announced a dividend of 1s. per share (less tax) on the ordinary shares, being at the rate of 10 per cent. per annum for the half-year ended June 30th last.

The Western Telegraph Co., Ltd., reports that the income for 1930 was £346,765, plus £34,000 allocated last year to cover losses on sale of investments. The gross revenue in the preceding period of 21 months was £748,977. After providing for debenture interest, &c., it is proposed to pay a dividend of 11 per cent. on the ordinary stock, leaving £441 to be carried forward, against £291.

The Consolidated Gas, Electric Light & Power Co. of Baltimore shows a gross revenue for the three months ended June 30th of $7,278,297, as compared with $7,186,125 for the corresponding period of 1930. The surplus available for dividends amounted to $1,657,309, while the preferred and common dividends paid amounted to $1,329,836.

Vickers, Ltd., have announced interim dividends of 2½ per cent. on the preferred 5 per cent. stock (less tax), 2½ per cent. on the 5 per cent. preference shares (less tax), and 2½ per cent. on the cumulative preference shares (free of tax).

Joseph Lucas, Ltd., have declared dividends for the period ending August 31st, 1931, of 6d. per share on the "A" preference and 7.2d. on the "B" preference shares, in each case subject to tax at 4s. 6d. in the £.

The Yorkshire Electric Power Co., in declaring dividends at the rate of 6 per cent. per annum on the preference and ordinary capital, states that the output has been maintained during the past half-year.

The Yorktown (Camberley) & District Gas & Electricity Co. has declared an interim dividend of 6½ per cent. per annum, less tax, on the ordinary stock (against 5 per cent. per annum in the preceding year).

The Bristol Tramways & Carriage Co., Ltd., has declared an interim dividend of 3 per cent. (less tax) on the ordinary shares for the half-year ended June 30th.

The Northampton Electric Light & Power Co., Ltd., has declared interim dividends of 4 per cent. on the old ordinary shares, and 2d. per share on the new ordinary shares.

The Rushden & District Electric Supply Co., Ltd., has declared an interim dividend of 3½ per cent. on the share capital.

The City of Buenos Ayres Tramways Co. (1904), Ltd., has declared a quarterly dividend of 1¼ per cent. (same).

Stocks and Shares

Tuesday Evening.

Seven Months' Prices

In accordance with our usual practice at this time of the year, comparative tables are presented to indicate the tendency of prices over the period covered by the first seven months of the year. The financial events of 1931 have brought disaster to many investors. Politics wrought widespread damage to prices. Only amongst gilt-edged securities has there been any measure of strength. The electric supply group stands out as the one bright exception to the welter of weakness that "distinguishes" industrial descriptions. It may be as well, all things considered, to start with this table, as it contains rises in the prices of the London companies' shares with only two which fail to follow the general rule. These are County of London ordinary, and Metropolitans, to both of which there attaches a degree of speculation greater than that which obtains in the other cases:—

Ordinary share.	Dec. 30th, 1930.	Now.	Rise or fall.
Brompton	27/6	28/6	+1/-
Charing Cross ...	29/-	31/-	+2/-
Chelsea	27/6	28/-	+6d.
City of London ...	36/3	37/-	+9d.
County	47/6	45/-	−2/6
Kensington ...	27/6	29/6	+2/-
London	32/6	34/-	+1/6
Metropolitan ...	42/-	40/7½	−1/4½
St. James'	28/-	29/6	+1/6
South London ...	27/-	27/6	+6d.
Westminster ...	29/-	30/-	+1/-

Notwithstanding the fact that the dividends on most of these shares are to be lowered to a general rate of 7 per cent. from the end of the present year, investment has readily absorbed whatever shares came to market. The demand, throughout the seven months, has exceeded supply. The impression prevails that, before the new standard of dividend comes into force, the companies will distribute further sums from their reserves, and thereby compensate proprietors, at least partially, for diminished income rates.

Home Railway Changes

Home Railway stocks have suffered from the depressing conditions that affected trade as a whole. Tube Railway stocks gave way upon publication of the Government's London Passenger Transport Bill. The Metropolitan Railway has reduced its interim dividend. Four representative issues in this section may be quoted to show the trend of price-fluctuations :—

Stock or share.	Dec. 30th, 1930.	Now.	Fall.
Central London ...	79	77	2
Metropolitan	68¼	42½	26
Metropolitan District	77	61½	15½
Underground	24/6	20/-	4/6

British Electric Traction deferred stock started the year at 1325. The present price shows a fall of 450 points, at 875. A severe contraction has occurred in Anglo-Argentine Tramways 5 per cent. debenture stock, which has dropped from 55½ to 20¼. Business was done a few days ago at 18. Up to the present, the interest has been regularly met.

Cables and Wireless

Last year's falls of 26 in Cables & Wireless preference and 53 in the "A" ordinary stock have been continued in the period under review. The dividend due to be paid on the preference stock next month is to be postponed for consideration when the current twelvemonth ends. The Imperial Advisory Council has appointed a committee of three, to investigate the conditions of working, and to report upon the outlook. This table gives representative examples of price movements :—

Stock or share.	Dec. 30th, 1930.	Now.	Fall.
Anglo-Amer. pref. ...	103¼	103	¼
Cables & Wireless pref.	70	47½	22½
" " "A"	22½	12	10½
" " "B"	11½	7	4½
Globe ordinary ...	13	6	7
Gt. Northern	30	25	5
Marconi Marine ...	38/9	31/3	7/6

The fall in Globe Telegraphs is the natural outcome of the weakness in Cables & Wireless stocks. The Globe Company, like Marconi Wireless, has reduced its dividend. Marconi Marines are lower in consequence of the depression in the shipping industry, and the possibility thus entailed of a dividend cut.

Dollar Stocks

American Telephone and Telegraph stock has lost no more than 2¼ points, and International Telephone & Telegraph is actually higher by 8¼ than it was at the beginning of this year. Prices of American-Canadian utilities are mostly lower, as a handful of illustrations will suffice to show :—

Stock or share.	Dec. 30th, 1930.	Now.	Rise or fall
Amer. Tel. & Tel.	182¼	175	− 7¼
Braz. Traction ...	21	19	− 2
Calgary Power ...	152	145½	− 6½
Int. Tel. & Tel. ...	20½	29	+ 8½
Mexican Light ...	42½	25	−17½
Mexico Trams ...	10	9½	− ½
Shawinigan ...	52	42½	− 9½

Equipment and Manufacturing

As may well be supposed, the list of manufacturing and equipment shares has nothing favourable with which to cheer proprietors. The outstanding feature is a slump of 45 points in Brush ordinary stock, due to a halving of the previously-paid dividend. The drop in Telegraph Constructions follows that in the Cables group. Other falls are the result of general conditions. Their extent can be seen in this selection of shares in well-known companies :—

Share.	Dec. 30th, 1930.	Now.	Fall.
Babcock	49/6	43/9	5/9
Br. Aluminium ...	30/6	27/-	3/6
Br. Insulated ...	3⅜	2⅜	⅛
Brush	105	60	45
Callender's	3¼	2¼	1
Enfield Cables ...	4 5/16	4	5/16
G.E.C.	2 3/16	2 1/32	5/32
Henley's	5⅛	5¼	⅛
India Rubber ...	6/3	4/6	1/9
Johnson & Phillips ...	36/9	28/9	8/-
Siemens	21/3	20/9	6d.
Tel Construction ...	16½	11	5½

Bank rate at the beginning of the year stood at 3 per cent. It was reduced in May to 2½. Every prospect pointed to the likelihood of this coming down to 2 per cent., but a German crisis suddenly developed. France took millions of gold from the Bank of England. The rate rose to 3½ per cent. on July 23rd and to 4½ per cent. a week later. Disappearance of the monetary ease caused an inevitable fall in gilt-edged securities, and Mr. Snowden's declared preparations for conversion of the 5 per cent. War Stock are not likely to be tested for some time to come.

By an error which occurred in these notes last week we stated that a fall of 10 points had occurred in Electric Construction 6 per cent. debenture; the statement related to the 6 per cent. debenture of the English Electric Company. The Electric Construction Co. has no 6 per cent. debenture: its 4 per cent. debenture stock is quoted at 65½.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend 1929.	1930.	Price Aug. 4 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—	5 0 0
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb. ...	Stock	—	4½	97½	−½	4 12 4
Charing Cross Ordinary	1	8½	8½	31/-	—	4 10 4
Chelsea	1	8⅝	8⅝	26/-	—	5 0 0
City of London	1	10	10	37/-	—	5 8 1
Clyde Valley	1	8	8	33/9	—	4 14 10
County of London	1	7	10	45/-	−1/8	4 9 0
Edmundsons' 7% Pref.	1	7	7	26/-	—	5 7 8
Elec. Supply Corporation	1	11	12½	45/-	—	4 17 9
Kensington Ordinary	1	8	8	29/6	—	5 8 6
Lancs. Light and Power	1	7	6½	21/3	−1/8	6 2 4
London & Home Counties 4½% Deb.	Stock	—	—	97½	—	4 12 6
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	2 5/16	—	4 18 9
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	28/3	—	5 13 3
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.... ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	29/6xd	—	4 14 1
Scottish Power	1	8	8	28/3	−6d.	5 13 3
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	28/3	—	4 19 1
Westminster Ordinary	1	9½	8½	30/-	—	4 13 4
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/9	—	5 16 8
Yorkshire Elec.	1	8	8	31/3xd	—	5 2 5

Home Rails

Central London Ord. Assented ...	Stock	4	4	77	—	5 3 6
Metropolitan	,,	4	3½	42½	−2	8 4 8
do. District	,,	5	5	61½xd	−1	8 2 8
Underground Electric	£1	8	8	20/-xd	—	8 0 0

Telegraphs and Telephones

Anglo-Am. Tel. Pref....	Stock	6	6	103xd	—	5 17 8
do. Def-	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	12½	12½	32/6	—	7 18 10
Cables & Wireless 5½% Pref. ...	Stock	5½	5½	47½	−5	... ...
do. A 7½% Ord.	,,	Nil	—	12	−2	... ...
do. B Ord.	,,	Nil	—	7	−1	... ...
Globe Tel. and T. Ord.	10	10	8½	6	−1	... ...
do. do. Pref.	10	6	6	9	—	6 13 4
Great Northern Tel.	10	20	20	25	−1	8 0 0
Marconi-Marine	1	15	15	31/3	−1/8	9 11 8
Oriental Telephone Ord.	1	12	12	2½	—	*5 6 6

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	—	12/6	—	... ...
do. do. 2nd Pref. ...	5	6	—	7/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	£0½	−2	3 16 4
British Electric Traction Def. Ord.	,,	5	5	875	−50	... ...
do. do. Pref. Ord. ...	,,	8	8	124½	—	6 8 9
Brazil Traction	100	8	—	19	−½	... ...
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	96½	—	5 3 3
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	12/-	—	... ...
London United Tram Deb. ...	Stock	4	4	63½	—	6 7 0
Mexico Trams, 5% Bonds	—	5	5	40	−2½	12 10 0
Mexican Light Common	100	Nil	Nil	25	−13	... ...
do. 7% Pref.	100	7	7	63½	−8	11 0 6
do. 1st Bonds	—	5	5	72½	−3	6 18 0
Victoria Falls Ord.	1	15	15	57/6xd	—	5 4 4
Yorkshire (West Riding)		Nil	Nil	6/3	—	... ...

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	20 9	+9d.	5 15 8
do. Pref.	1	8	8	28/3	—	5 12 8
Babcock & Wilcox	1	15	14	43.9	−1/8	*6 7 10
British Aluminium Ord.	1	10	10	27/-	−6d.	7 8 2
British Insulated Ord.	1	15	15	2½	—	5 9 1
Brush Ord.	Stock	10	5	60	—	8 5 0
Callenders	1	15	15	2½	—	5 9 1
do. 6½% Pref....	1	6½	6½	26/3	—	4 19 1
Crompton Parkinson Ord.	5/-	80	80	1/2	—	8 0 0
do. 8% Pref.	1	8	8	28/3	—	5 18 8
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
do. 5% Deb	Stock	5	5	99½	—	5 8 1
Electric Construction ...	1	5	Nil	10/-	−1/8	... ...
Enfield Cable Ord.	1	25	25	4	—	6 5 0
English Electric	1	Nil	Nil	5/-	—	... ...
do. do. Pref. ...	1	Nil	Nil	5/-	—	... ...
Ferranti Pref.	1	7	7	20/6	—	6 16 7
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	14	10	2 5/8	+1/2	4 18 5
Henley	1	30	30	5½	—	5 14 3
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	... ...
Johnson & Phillips	1	10	10	28/9	—	6 19 2
Siemens Ord.	1	7½	7½	20/9	—	7 4 7
Telegraph Construction	12	10	7½	11	—	8 2 0

*Dividends paid free of Income Tax.

Australian Electrical Import Trade

Values for 1928-9 and 1929-30 compared

THE following figures showing the values of the imports of electrical goods into Australia in the fiscal year 1929-30 have been taken from the recently-issued official trade returns. The corresponding figures for the previous twelve months have been added for the purposes of comparison, and notes of increases or decreases are given :—

	1928-29. £	1929-30. £	Inc. or dec. £
Arc lamps, except for kinematographs—			
Total	1,700	500	– 1,200
From United Kingdom	80	60	– 20
,, Germany	800	360	– 440
,, United States	700	70	– 630
Dry cells—			
Total	180,000	115,000	– 65,000
From United Kingdom	15,000	20,000	+ 5,000
,, Germany	15,300	10,500	– 4,800
,, United States	124,000	77,000	– 57,000
Nickel alkaline batteries—			
Total	4,000	300	– 3,700
Storage batteries with plates larger than 7¾ in. × 10 in.—			
Total	21,000	3,300	– 17,700
From United Kingdom	18,000	3,000	– 15,000
Other storage batteries—			
Total	449,000	181,000	–268,000
From United Kingdom	247,000	99,000	–148,000
,, United States	188,000	76,000	–112,000
Other batteries—			
Total	41,000	35,000	– 6,000
From United Kingdom	5,900	7,300	+ 1,400
,, Germany	8,700	11,500	+ 2,800
,, United States	26,000	16,000	– 10,000
Cable and wire, covered with cotton—			
Total	22,000	20,000	– 2,000
From United Kingdom	21,000	20,000	– 1,000
,, United States	200	200	—
Cable, telegraph and telephone, paper insulated, lead covered—			
Total	35,500	21,000	– 14,500
From United Kingdom	35,500	16,000	– 19,500
Other telegraph and telephone cable—			
Total	*	65,000	—
From United Kingdom	*	64,000	—
Power cable, paper insulated, lead covered—			
Total	*	413,000	—
From United Kingdom	*	411,000	—
Other cable and wire—			
Total	1,260,000	998,000	–262,000
From United Kingdom	1,193,000	933,000	–260,000
Carbon manufactures—			
Total	30,000	37,000	+ 7,000
From United Kingdom	13,000	14,000	+ 1,000
,, United States	11,000	13,000	+ 2,000
,, Germany	3,000	4,500	+ 1,500
Dynamo-electric machines, a.c.—			
Total	478,000	422,000	– 56,000
From United Kingdom	326,000	272,000	– 54,000
,, Switzerland	11,000	8,000	– 3,000
,, Germany	15,000	4,600	– 10,400
,, United States	107,000	121,000	+ 14,000
Dynamo-electric machines, d.c.—			
Total	261,000	217,000	– 44,000
From United Kingdom	185,000	155,000	– 30,000
,, Germany	19,000	14,000	– 5,000
,, Switzerland	2,300	2,000	– 300
,, United States	47,000	44,000	– 3,000
Dynamo-electric machines, universal—			
Total	7,300	19,000	+ 11,700
From United Kingdom	2,700	18,000	+ 15,300
,, United States	3,700	500	– 3,200
Fans, electric—			
Total	42,000	56,000	+ 14,000
From United Kingdom	7,000	10,000	+ 3,000
,, Italy	18,000	17,000	– 300
,, United States	10,000	22,000	+ 12,000
Small self-contained lighting sets—			
Total	18,400	11,800	– 6,600
From United Kingdom	5,600	5,700	+ 100
,, United States	11,500	5,700	– 5,800
Switches, fuses and lightning arrestors—			
Total	436,000	360,000	– 76,000
From United Kingdom	330,000	264,000	– 66,000
,, United States	96,000	80,000	– 16,000
,, Germany	5,300	6,000	+ 700
Heating and cooking appliances—			
Total	105,000	111,000	+ 600
From United Kingdom	34,000	59,000	+ 500
,, Canada	21,000	35,000	+ 14,000
,, United States	39,000	27,000	– 12,000
Lamps, filament—			
Total	664,000	628,000	– 36,000
From United Kingdom	296,000	339,000	+ 43,000
,, Hungary	4,000	3,400	– 600
,, Austria	18,000	18,600	+ 600
,, Holland	252,000	198,000	– 54,000
,, United States	51,000	26,000	– 25,000
Measuring and recording instruments—			
Total	154,000	113,000	– 41,000
From United Kingdom	73,000	63,000	– 10,000
,, Switzerland	20,000	10,000	– 10,000
,, United States	40,000	30,000	– 10,000
,, Canada	17,500	2,000	– 15,500
Regulating and controlling apparatus—			
Total	297,000	366,000	+ 69,000
From United Kingdom	182,000	198,000	+ 16,000
,, United States	101,000	147,000	+ 46,000
,, Switzerland	3,700	6,200	+ 2,500
,, Canada	3,400	1,000	– 2,400
Static transformers and induction coils—			
Total	142,000	144,000	+ 2,000
From United Kingdom	95,000	99,000	+ 4,000
,, Sweden	4,500	1,200	– 3,300
,, United States	24,000	24,000	—
Telegraph instruments and appliances—			
Total	3,000	7,000	+ 4,000
From United Kingdom	2,500	4,300	+ 1,800
,, United States	500	200	– 300
Telephones—			
Total	64,000	54,000	– 10,000
From United Kingdom	52,000	46,000	– 6,000
,, Sweden	600	700	+ 100
,, United States	9,000	5,000	– 4,000
,, Germany	2,400	1,700	– 700
Telephone switchboards and appliances—			
Total	297,000	301,000	+ 4,000
From United Kingdom	260,000	252,000	– 8,000
,, Belgium	7,000	5,200	– 1,800
,, Sweden	1,700	800	– 900
,, United States	20,000	38,000	+ 18,000
Vacuum tubes, electrical—			
Total	31,000	42,000	+ 11,000
From United Kingdom	6,000	11,000	+ 5,000
,, Holland	16,000	5,400	– 10,600
,, United States	9,000	25,000	+ 16,000
Valves for wireless telegraphy or telephony—			
Total	225,000	204,000	– 21,000
From United Kingdom	61,000	70,000	+ 9,000
,, Holland	105,000	57,000	– 48,000
,, United States	53,000	75,000	+ 22,000
Wireless receiving sets, accessories and parts—			
Total	399,000	403,000	+ 4,000
From United Kingdom	85,000	70,000	– 15,000
,, France	1,000	700	– 300
,, Germany	28,000	28,000	—
,, Holland	32,000	72,000	+ 40,000
,, United States	251,000	228,000	– 23,000
Electrical appliances, n.e.i.—			
Total	442,000	598,000	+156,000
From United Kingdom	197,000	264,000	+ 67,000
,, Canada	6,000	3,000	– 3,000
,, Belgium	—	14,000	+ 14,000
,, Germany	34,000	50,000	+ 16,000
,, United States	151,000	207,000	+ 56,000
,, Switzerland	1,000	3,000	+ 2,000
Electrical ware of earthenware, including insulators—			
Total	47,000	31,000	– 16,000
From United Kingdom	6,000	6,000	—
,, Canada	1,900	4,000	+ 2,100
,, Japan	2,600	2,300	– 300
,, United States	33,000	16,000	– 17,000
Electrical insulating paper and boards—			
Total	28,400	26,600	– 1,800
From United Kingdom	18,000	12,700	– 5,300
,, United States	7,000	7,600	+ 600

Australia carries on a small export trade in electrical goods of her own manufacture. The total value for 1929-30 was £60,000, against £61,000 in the preceding year.

* Not specified.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Hire-purchase

Mr. Jarvie's reply in your issue of July 24th makes my criticisms appear quite justified. He makes it clear, to use his own words, that nothing will be done to secure more electrical hire-purchase business at the expense of his so-called sound principles. It is also clear that these sound principles are in reality the transferring of every possible risk to someone else. Undoubtedly from everyone's point of view this is very sound indeed—if it will work! But it is also very unfair. I venture to say that the electrical contractor will have little or nothing to do with it and one cannot wonder at Mr. Jarvie's complaint regarding electrical hire-purchase business being ludicrously small.

The Macmillan report which Mr. Jarvie quotes, states very definitely that the risk in granting such credit is small. But, mark you, even that small risk must be put entirely on someone else's shoulders. If, as is stated, such careful inquiries are made as to the standing of the purchaser, why should the contractor still have to take all the risk? It is unfortunate that these one-sided "sound principles" should be allowed to interfere so much with business that is literally waiting to be carried into effect. Our country is starving for good business and these financial houses are frankly holding it up whilst playing for safety first and all the time—for themselves.

It is not necessary that the financial houses should repossess themselves of goods. Other arrangements can overcome this difficulty. I suggest that the Electricity Commissioners or some other body with authority should get down to the facts as they are and ascertain why existing schemes are failing. Unquestionably they are failing and the average electrical contractor has good reason for leaving them alone.

There *is* something wrong: that is obvious. Cannot more efforts be made to overcome the defects which exist?

July 29th, 1931. INTERESTED.

Family Allowances

Industrialists in this country have paid surprisingly little attention to a post-war movement which, among some of our Continental competitors, is recognised as having an important bearing on the wage-bargain.

About a year ago the Belgian Parliament enacted a Law providing that all employers should pay allowances to their workpeople in respect of dependent children. A similar Bill has recently been passed without debate by the French Chamber.

These measures are not pieces of compulsory philanthropy thrust upon long-suffering employers by an unsympathetic government, but have been taken with the support of the great majority of industrialists who already pay family allowances, and of the trade unions which, although originally opposed to the system, have for some time been in favour of its compulsory extension. In both countries, where employers have had more than ten years' experience of the practical working of family allowances on a voluntary basis, they are satisfied that it has reduced labour turnover, lessened industrial strife, and improved the health of the children.

The movement began in most European countries towards the end of the war, when the difficulty of giving wage increases to meet the steadily rising curve of prices forced employers to consider whether the sum spent in wages was being distributed in the most economical way. They found that the demand of the married men for a living wage for their families could only be met if, instead of spreading cost-of-living allowances over all employés on the assumption that at some time or other most of them would have families, they concentrated their resources on the actually existing families by means of monthly or weekly allowances paid in respect of each dependent child. The most successful schemes were those where the allowances were paid to the mother from an equalisation pool, to which each employer in an industry or locality contributed in proportion either to his total wage bill or to the total number of workers he employed, irrespective of whether they were married or single. This proved effective in preventing the danger that employers, if required to pay directly, would avoid the employment of men with families. The system has persisted, and family allowances are now paid in some employments in most of the industrialised States of Europe, as well as in some of our own Dominions; their application is most widespread in France, Belgium, Germany, and Holland, and, outside Europe, in New Zealand and New South Wales.

In most instances family allowances have been introduced on a rising market, but there is an equally strong case for their introduction in a time like the present as a means of mitigating the hardship of wage reductions.

We do not advocate a slavish imitation of the methods suited to the needs of other countries, but we do suggest that the principle of family allowances is sound, and that its practical application deserves careful consideration as a practical means of safeguarding our standard of life without overburdening industry.

THE FAMILY ENDOWMENT SOCIETY,
18, Abingdon Street, London, S.W.1. M. E. Green,
July 27th, 1931. *Secretary.*

Petrol-electric Vehicles

With reference to the letter from Messrs. T. S. Motors, Ltd., which appeared in your issue of June 26th, the percentage of time which the engine would be driving direct in an electro-mechanical drive depends largely on the relative speeds of the engine and the dynamo and on the gear ratio at the back axle. By judiciously designing the drive to the particular conditions of service, the *average* percentage referred to will assuredly be a large one, even in vehicles confined to city traffic.

By embodying a clutch in the electrical drive of a motor coach, or suchlike vehicle, the advantages will be even greater than in an omnibus, as with the former the clutch would be in operation for a still greater proportion of time.

The saving in weight in an electrical drive, such as that under discussion, is largely due to the increased speed of the dynamo. There are, however, other factors which lessen the weight considerably.

I am certain that if those engaged in the electrical industry took a more active interest in, and were more fully awakened to, the merits and possibilities of the electrical drive the result would be advantageous to all concerned. The points discussed in this correspondence have not, I hope, been without interest and I thank T. S. Motors, Ltd., for having raised them.

Pasadena, Cal., U.S.A., *July 20th*, 1931. J. W. BURLEIGH.

[This correspondence is now closed.—EDS. ELEC. REV.]

Repulsion-start Induction Motors

It was not with the slightest intention of ridiculing Mr. D. G. Sandeman's statement regarding the starting torque of repulsion induction motors that we wrote our previous letter, and we are sorry that Mr. Percy Huggins read it in that light.

We really wished to correct what we still consider to be an injustice to many repulsion-start induction motors, not only those supplied by ourselves, but by other British and American manufacturers also.

There is no doubt whatever that Mr. Sandeman's statement leads one to believe that starting torques greater than 250 per cent. of full-load torque are unobtainable with the type of motor in question.

Mr. Huggins appears to have gained the erroneous impression that we claim five times full-load torque for the majority of repulsion induction motors. If he will read our letter carefully he will see that we claim that starting torques of five times full-load torque are possible, whereas Mr. Sandeman's article gives the impression that more than 2½ times is impossible. The majority of our own ratings give between three and five times full-load torque, but it is, of course, true that six- or eight-pole motors cannot be expected to give as great a torque as two- or four-pole machines, but the torque certainly should be better than 2½ times full-load torque. However, in generalising it is fair to exclude all but four-pole machines, as their sale exceeds all others in a ratio of about 50/1, and it is to such machines that we refer in general.

There is certainly some credit due to the manufacturer who has produced a ¼-h.p. motor with a full-load current 10 per cent. lower than the nearest competitor with which it was compared. Nevertheless, we shudder to think what would happen to this machine with only 2½ times full-load torque at starting when coupled to a compressor not fitted with an "unloader" and automatically controlled by a pressure switch. Such drives are quite common, and for this reason the motor would not be considered satisfactory unless some knowledge of its ultimate duty were known. The motor would certainly be very satisfactory for many applications, but there are also many for which it would utterly fail, so perhaps our contention may not be quite such sheer bunkum as your correspondent would have us think. After all, a 10 per cent. saving in the running current of a ¼-h.p. motor is not likely to have any large effect upon the power bill of the user.

We are in complete agreement with Mr. Huggins that it would be a great mistake to sacrifice efficiency and power factor on the altar of starting torque, but at the same time it is a bigger mistake to sacrifice starting torque to a dangerous degree in favour of power factor and efficiency. It should, therefore, be the aim of the designer to obtain a good balance between the three.

POWER CONTRACTS (BATWIN), LTD.,
H. G. Poxon, *Sales Dept.*
London, *July 31st*, 1931.

Earthing the Neutral

I note in your issue of July 31st a letter from "Perplexity" with reference to the factor 2.5 in my calculation in a recent article. I should point out that I had to assume some maximum current for the line under consideration and, by taking 2.5 times the current rating of the fuse, I think I was following the usual method in such cases.

I must apologise to "Perplexity" for not making this matter clear, although it appeared to me that the explanation would be obvious; that it was not is a reflection upon myself, and not upon your correspondent.

T. C. GILBERT.
Folkestone, *August 1st*, 1931.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

1,548. "Methods and means for recording telephone calls on the automatic dialling system." E. W. White and H. P. Amphlett. January 16th, 1930. (352,554.)

3,889. "Timing or retarding devices applicable to electro-magnetic relays, switches and the like." Ateliers de Constructions Electriques de Charleroi. May 28th, 1929. (352,447.)

6,593. "Photo-electric apparatus." P. M. G. Toulon. March 15th, 1929. (352,388.)

7,380. "Radio instrument for determining elevation." W. S. Eaton. March 16th, 1929. (352,518.)

7,413. "Automatic and semi-automatic telephone systems." Telefonaktiebolaget L.M. Ericsson. March 7th, 1929. (352,452.)

9,972. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. April 4th, 1929. (352,389.)

10,310. "Electrically-illuminated advertising signs and the like." A. L. Landau. April 1st, 1930. (Cognate application 37,902/30.) (352,473.)

10,325. "Electrical accumulators, polarisation cells, and electrolytic rectifiers and condensers." Britannia Batteries, Ltd. (Accumulatoren-Fabrik Akt.-Ges.). April 1st, 1930. (352,394.)

10,447. "Electric generating plant." R. A. Lister & Co., Ltd., and F. A. Attwood. April 2nd, 1930. (352,524.)

10,490. "Electrical connectors." J. J. Beakey. May 6th, 1929. (352,456.)

10,493. "Terminal blocks for electrical apparatus." A. Kupeczek, and Measurement, Ltd. April 2nd, 1930. (352,398.)

10,515. "Aerials." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. April 2nd, 1930. (352,399.)

10,571. "Reception of telegraph signals." Standard Telephones & Cables, Ltd., E. K. Sandeman, A. J. Chanter, and L. E. Currah. April 3rd, 1930. (352,401.)

10,624. "Electrically-driven roller-way conveyors." F. Krupp Grusonwerk Akt.-Ges. May 29th, 1929. (352,402.)

10,979. "Artificial-line networks for electrical signal transmission lines." Western Union Telegraph Co. April 12th, 1929. (352,409.)

11,013. "Control of synchronous dynamo-electric machines." British Thomson-Houston Co., Ltd., and D. E. Jowitt. April 7th, 1930. (352,413.)

11,048. "Piezo-electric substances." P. Freedman and W. J. Rickets. April 7th, 1930. (352,419.)

11,152. "Telephone systems." Siemens Bros. & Co., Ltd., D. A. Christian, and D. P. Long. April 8th, 1930. (Patent of addition not granted.) (352,529.)

11,177. "Radio direction-finding apparatus." Marconi's Wireless Telegraph Co., Ltd., and F. Woods. April 8th, 1930. (352,463.)

11,178. "Microphones and apparatus for use therewith." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. April 8th, 1930. (352,464.)

11,206. "Impulse-transmitters for use in telephone or like systems." Automatic Telephone Manufacturing Co., Ltd., and S. R. Smith. April 8th, 1930. (Addition to 234,036.) (352,469.)

11,393. "Electric protective systems." A. Reyrolle & Co., Ltd., and H. Leben. April 10th, 1930. (Cognate application 27,456/30.) (352,500.)

11,394. "Polyphase commutator motors." J. H. Holmes and Co., Ltd., and W. Marden. April 10th, 1930. (Cognate application 38,830/30.) (352,501.)

11,471. "Electric upsetting and forging machines." G. Benedetto. April 10th, 1930. (352,508.)

11,472. "Electric upsetting and forging." G. Benedetto. April 10th, 1930. (352,509.)

12,044. "Electric clocks." A. Wirz. April 16th, 1930. (352,560.)

12,096. "Cut-out devices for electric motors in signalling systems." Electrical Research Products, Inc. April 20th, 1929. (352,567.)

12,588/9. "Electrically-operated clocks." T. Mercer and F. Mercer. April 23rd, 1930. (352,582/3.)

12,846. "Radio-signalling systems." Siemens & Halske Akt.-Ges. April 25th, 1929. (352,590.)

12,905. "Means for starting the engines of electric generating plant in which the prime mover is a compression-ignition engine." R. A. Lister & Co., Ltd., and F. A. Attwood. April 26th, 1930. (352,591.)

13,022. "Compressed-air drive for electric switches." Siemens-Schuckertwerke Akt.-Ges. and O. T. Post. April 28th, 1930. (352,593.)

13,148. "High-tension transformers." Akt.-Ges. Brown, Boveri et Cie. June 17th, 1929. (Addition to 332,138.) (352,596.)

13,462. "Traffic-control signal systems." H. A. Gill (Automatic Signal Corporation). May 1st, 1930. (352,601.)

13,482. "Notching-mechanism for electric controllers or the like." British Thomson-Houston Co., Ltd. May 1st, 1929. (352,602.)

13,582. "Producing negative electrodes for electric accumulators." Soc. Italiana Batterie Elettriches Cellino. May 2nd, 1929. (352,604.)

13,762. "Electric protective devices." Siemens Bros. & Co., Ltd., and F. Baker. May 5th, 1930. (352,609.)

13,790. "Electric contact-breakers." British Thomson-Houston Co., Ltd., and W. Hewitt. May 5th, 1930. (352,612.)

13,889. "Controllers for reversible electric motors." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). May 6th, 1930. (352,613.)

14,059. "Electrical propulsion of ships." General Electric Co., Ltd., and H. J. Coates. May 7th, 1930. (352,615.)

14,355. "Electron-discharge apparatus." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 19th, 1929. (352,617.)

14,391. "Electric telegraph and like transmitters." Marconi's Wireless Telegraph Co., Ltd. May 21st, 1929. (352,621.)

14,821. "Automatic switch with thermostatic control." Landis & Gyr Soc. Anon. June 27th, 1929. (352,628.)

15,022. "Electric signalling systems." C. Lorenz Akt.-Ges. May 28th, 1929. (352,632.)

15,035. "Means for operating eddy-current rail brakes." Siemens-Schuckertwerke Akt.-Ges. and Ges. für Oberbauforschung. November 12th, 1929. (352,633.)

15,123. "Electric lead-through insulators." J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.). May 16th, 1930. (352,635.)

15,792. "Electrical fuses." Associated Electrical Industries, Ltd. May 27th, 1929. (352,648.)

15,834. "Printing-presses and electrical drives thereof." Igranic Electric Co., Ltd., A. H. Mackley, J. R. Taylor, and L. N. Stone. May 22nd, 1930. (352,649.)

16,068. "Electric arc lamps." R. V. Boardman. May 24th, 1930. (352,653.)

16,189. "Mercury-arc rectifiers." British Thomson-Houston Co., Ltd., and F. P. Whitaker. May 26th, 1930. (352,655.)

16,307. "Fusible electric cut-out and the mounting therefor." W. T. Henley's Telegraph Works Co., Ltd., W. H. Nichols, and E. Moor. May 27th, 1930. (352,660.)

18,622. "Inductor relays." Associated Electrical Industries, Ltd. June 18th, 1929. (352,691.)

18,971. "Sheaths of electric cables and pipes of lead and lead alloys." Callender's Cable & Construction Co., Ltd., H. Hill, and S. Beckinsale. June 21st, 1930. (352,700.)

19,252. "Coupling arrangements for use in high-frequency circuits." Marconi's Wireless Telegraph Co., Ltd. August 20th, 1929. (352,706.)

19,441. "Electric switches for railway and like signalling systems." Siemens & General Electric Railway Signal Co., Ltd., F. Downes, and W. D. Rogers. June 26th, 1930. (352,709.)

19,447. "Electric discharge tubes having a cooling jacket." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 6th, 1929. (352,710.)

19,573. "Earthing devices." Electrolux, Ltd. July 25th, 1929. (352,712.)

19,845. "Electric incandescent lamps." Falk, Stadelmann and Co., Ltd. (W. Berger). June 30th, 1930. (352,716.)

20,434. "Recording electrical impulses." M. Volmer. July 6th, 1929. (352,727.)

20,746. "Screening of thermionic valves." Mains Radio Gramophones, Ltd., and E. H. Roberts. July 9th, 1930. (352,733.)

22,596. "Arrangements for determining the transmission characteristics of electrical apparatus, circuits, or transmission lines." Automatic Telephone Manufacturing Co., Ltd., and T. H. Turney. July 26th, 1930. (352,752.)

22,690. "Gaseous electric discharge devices." British Thomson-Houston Co., Ltd. July 27th, 1929. (352,756.)

23,375. "Electric fuses or fuse-switches and the like." J. E. Allan and D. S. Maclachlan. August 5th, 1930. (352,765.)

24,027. "Amplifiers for reproducing sound." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 25th, 1929. (352,772.)

24,089. "Electric selecting switches." Siemens Bros. & Co., Ltd., W. E. Goodwin, and E. A. Forceville. August 12th, 1930. (Addition to 322,652.) (352,774.)

24,810. "Aerial systems." Telefunken Ges. für Drahtlose Telegraphie. August 27th, 1929. (352,779.)

25,099. "Cores for induction coils." R. Bosch Akt.-Ges. August 23rd, 1929. (352,783.)

25,849. "Wireless receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 18th, 1929. (352,791.)

26,167. "Low frequency transformers." B. Beck. September 2nd, 1930. (352,795.)

26,327. "Diaphragms for sound receiving, reproducing, amplifying, and transmitting instruments." H. Schmidt. October 15th, 1929. (352,798.)

26,547. "Means for heating the liquids of high-potential electric switches." Siemens-Schuckertwerke Akt.-Ges. December 21st, 1929. (352,800.)

28,235. "Time switches." Landis & Gyr Soc. Anon. September 26th, 1929. (352,818.)

28,438. "Variable electrical condensers." Sparks-Withington Co. October 30th, 1929. (352,822.)

28,782. "Electrical switches or circuit-breakers." S. Ruppel. December 23rd, 1929. (352,826.)

30,015. "Modulating circuits for radio transmission and the like." British Thomson-Houston Co., Ltd. October 7th, 1929. (352,836.)

30,017. "Explosion pots for oil switches." International General Electric Co., Inc. October 7th, 1929. (352,837.)

31,958. "Electrical contact breakers." R. Bosch Akt.-Ges. November 16th, 1929. (352,853.)

32,693. "Automatic control for a plurality of electric motors." International General Electric Co., Inc. October 31st, 1929. (352,857.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned:—

July 22nd.

Beyco. No. 522,789. Class 18. Electric fires, cooking stoves, boilers, etc.—Berkeley & Young, Ltd., King's Road, Hay Mills, Birmingham.

July 29th.

Marco (lettering and design). No. 521,651. Class 6. Refrigerating machines. No. 521,652. Class 18. Refrigerating chambers. No. 521,653. Class 50. Refrigerating chests.—Marco Refrigerators, Ltd., Manor Works, Streatham Vale, S.W.16.

Laneta. No. 521,744. Class 13. Electrical appliances made of ordinary metal. No. 521,745. Class 14. Electric hair waving appliances.—Laneta Products, Ltd., Audrey House, Ely Place, Holborn, E.C.1.

Pyrstaline. No. 521,860. Class 50. Moulding powders of urea; and Prystal. No. 521,861. Class 50. Synthetic resins made principally from urea and formaldehyde and sold in sheets, rods or tubes.—Société Nobel Francaise, 67, Boulevard Haussmann, Paris, France. (British representatives: Cope & Co., 65, Victoria Street, Westminster, S.W.1).

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashby-de-la-Zouch.—Sewage disposal works for the R.D.C.; F. S. Eagles, engineer, 71, Temple Row, Birmingham.

Bathgate.—Public baths (electric lighting); W. A. Cullen, town clerk.

Becontree.—Post office, Five Elms Road; H.M. Office of Works.

Bedford.—School extensions for the borough E.C.; O. P. Milne, architect, 64, Wigmore Street, London, W.1.

Bilston.—Villiers school (£14,947) for the E.C.; H. T. Marchant and Co., builders. Factory, Loxdale estate, for the Wednesbury Tube Co., Ltd.

Birkenhead.—Central school, Whetstone Lane, for the E.C.

Blackpool.—Senior school, Glastonbury Avenue, Whitegate Drive; Dr. Ikin, director of education.

Boston.—Enlargement, Skirbeck Hospital; borough engineer.

Brentford.—Extensions, West Middlesex Hospital (£12,829); L. & W. Whitehead, Ltd.

Bridlington (YORKS.).—Central school (£30,000) for the borough E.C.; P. M. Newton, borough architect.

Brighton.—Houses (26), Widdicombe Way, Bevendean; Brabons, Ltd. Extensions, 94-94a, London Road; Brighton Equitable Co-operative Society, Ltd.

Bristol.—Clearance scheme, St. Paul's area; city engineer. School, Knowle Park, for the city E.C.; A. R. Gough, architect, 24, Bridge Street.

Burley-in-Wharfedale.—Catholic church and presbytery, Bradford Road; L. J. Gallagher, builders, Smawthorne Lane, Castleford.

Bury.—Sewage disposal works, Unsworth; J. Bolton, sewage engineer to R.D.C., Sewage Works, Bury.

Chelmsford.—Housing scheme, Waterhouse Lane, and library (£20,800); borough engineer. Massage department, Chelmsford and Essex Hospital; governors.

Chingford (ESSEX).—R.C. schools (200 places); Rev. J. E. Howell.

Cornwall.—Girls' secondary school, St. Austell (£18,000), for the county E.C.; director of education, Truro.

Coventry.—Houses (200), Stoke Aldermoor site, for the T.C.; city surveyor. Congregational church, Wyken estate; trustees. Baths, Foleshill; borough engineer.

Cowdenbeath (FIFE).—Houses (40) for the T.C.; burgh surveyor.

Darlington.—Housing scheme, Aycliffe and Urworth, for the U.D.C.; Cayley & Jarvis, architects, 44, High Row, Darlington.

Devizes (WILTS.).—Houses (22), Caen Hill site, for the T.C.; A. W. Jakeway, borough surveyor.

Eccles (LANCS.).—Fire station, Patricroft (£8,485), for the T.C.; James Cocker, Ltd., builders, Walkden.

Edinburgh.—Housing scheme, Laughton golf course; city architect.

Erith (KENT).—Senior school, Northumberland Heath, for the E.C.; H. Hine, architect, The Oaks, Belvedere.

Essex.—Schools, Ilford (£52,648) and Buckhurst Hill, and technical college, Leyton (£119,394), for the county E.C.; J. Stuart, county architect, Chelmsford.

Flintshire.—Schools, Tryddyn, Flint, Rhyl and Buckley, for the county E.C.; director of education, Mold.

Gateshead.—School for the T.C.; F. H. Patterson, borough surveyor, Swinburne Street.

Gillingham (DORSET).—Re-erection of sawmills, Station Road, for Hudson & Martin.

Glossop (DERBYSHIRE).—Houses (50) for the T.C.; borough surveyor.

Gloucester.—Houses (234) for the T.C.; E. H. Hill, builder, Mansfield, Notts. Post office, King's Square, for H.M. Office of Works, King Charles Street, London, S.W. Offices, Shirehall, for the C.C.; E. S. Sinnott, county surveyor.

Halifax.—Motor omnibus depôt, Elm Wood; A. C. Tipple, borough engineer.

Hampshire.—School, Hordle, Baddesley and Chilworth, South Hayling, and Wootton Milton; director of education, Winchester.

Hastings.—Second section, reconstruction of White Rock baths (£42,800), for the T.C.; borough surveyor.

Hebburn-on-Tyne.—Senior school, Newcastle Road, for the E.C. (£12,000); T. A. Page & Sons, architects, 67, King Street, South Shields.

Hertfordshire.—Junior school, Stonehouse Lane, Hitchin; county surveyor.

High Wycombe.—Factory, Chairborough Road, for C. J. Faulkner. Post Office, Queen Victoria Road, for H.M. Office of Works, King Charles Street, London, S.W.

Hitchin (HERTS.).—Houses (26), Knebworth, for the R.D.C.; A. E. Passingham, clerk, 9, Bancroft, Hitchin.

Irish Free State.—(CLONAKILTY).—Hospital accommodation (£2,500) and improvements to County Home (£2,500) for the West Cork Board of Health.

Jarrow.—Houses (34); borough engineer.

Keswick.—Extensions to premises of the Keswick Co-operative Society, Ltd., St. John's Road; I. & R. Hodgson, builders, Stanger Street.

Kidderminster.—Houses (60) for the T.C.; borough surveyor.

Kingston-on-Thames.—Public baths (£98,000) for the T.C.; Bain & Johnson, architects, Leeds. School, Latchmere Lane (£9,700), for the borough E.C.; director of education.

Lancashire.—New school, Whitefield (650 places) and extension of the Council school, Little Lever; S. Wilkinson, county architect, 16, Ribblesdale Place, Preston.

Ledbury (HEREFORDSHIRE).—Houses (32) for the U.D.C.; Walter F. Bickford, architect.

Leeds.—Cinema, Harehills Lane; F. Thompson. Carnegie Physical Training College for Men, Beckett Park estate, Headingley, for the Corporation E.C.; Education Department (architects' section), Calverley Street.

Leicester.—Houses (341), Braunstone estate, and extension of home for mentally defectives (£9,000); city engineers.

Leigh.—Reconstruction of Infants' C.E. School; T. Yates, architect, 3, Silk Street.

Liverpool.—Conversion of Winter Gardens, Waterloo, into cinema; manager.

London.—(CHARING CROSS).—Premises for the Royal Empire Society, 18-21, Northumberland Avenue; Hart & Waterhouse. (EALING).—Houses (54), Elmbank Road; R. J. Ward, 107, Uxbridge Road, W. Cinema, Ruislip Road; A. R. A. Blay, architect, Rickmansworth. Houses (21), Netheravon Road; E. Read, Acton Vale, W.3. Houses (42), Lynwood and Kingfield roads; London and Provincial Building Co., Ltd. (TOTTENHAM).—Buildings for Grammar School (£58,437); H. Knight & Son.

Luton (BEDS.).—Six shops and dwellings, Dunstable Road, for H. C. Janes, Ltd.

Macclesfield.—Improvements and modernisation of bakery for the Macclesfield Equitable Provident Society, Ltd., 67, Sunderland Street; F. Fowler, architect, Parr's Bank Chambers.

Machynlleth (MONT.).—Cinema theatre, New Street, for W. Williams, Skinners Arms.

Maidenhead.—Bazaar premises, High Street, for Marks and Spencer, Ltd., London.

Maltby (YORKS.).—Houses (78) for the U.D.C.; Whittington (Doncaster), Ltd., builders.

Manchester.—Police station, Platt Lane, Rusholme; A. Hodkinson. Senior schools, Blackley and East Didsbury, for the E.C. Elementary school, Yew Tree Road, Fallowfield, and premises for Whalley Range High School; city architect.

Middlesbrough.—Building, Linthorpe Road and Garden Street, for Marks & Spencer, Ltd., Chiswell Street, London, E.C.; Bovis (1928), Ltd., builders, 43, Upper Berkeley Street, London, W.1.

Middlesex.—Elementary schools, Dormer Wells Lane, Southall, and Mutton Lane, South Mimms, for the county E.C.

Montgomeryshire.—Senior school, Arddleen, for the county E.C.; building surveyor, Newtown.

Nelson.—Extension of the sewage works; borough engineer.

Newhaven (SUSSEX).—Houses (58) for the Workman's Housing Association, Ltd.

Northampton.—Baptist school chapel, Park Avenue (£5,000); trustees.

Norton (YORKS.).—Houses (40), for the U.D.C.; surveyor.

Plymouth.—Houses (24), South Down Road; Selborne & Labell. Shop premises, 100-2, Fore Street; Marks & Spencer. Additions, Holy Cross School, Beaumont Road; Rev. Father Lee.

Portsmouth.—School, Northern Parade (£82,546), for the borough E.C.; director of education.

Rawtenstall (LANCS.).—Houses (86), for the T.C.; borough surveyor.

Redruth.—Extensions, West Cornwall Miners' and Women's Hospital; Leonard Winn, architect, Truro.

Reigate.—School (200 places), South Park, for the borough E.C.; secretary.

Ripon.—Additions to the Diocesan Training College for the Board of Governors; Wm. Birch & Sons, Ltd., builders, Spen Lane, York.

Rowley Regis.—Extensions, Macefields Senior School, for the E.C. (£6,589); Housing, Ltd., builders, Blackheath, Birmingham.

Scarborough.—Shops, tenements, and offices (£56,371), for the T.C.; F. W. Plaxton, builder.

Shipley (YORKS.).—Premises, Leeds Road, for Windmill Industrial Co-operative Society, Ltd.; J. Holson & Sons, Windmill, Shipley, builders.

Smethwick.—Library and clinic buildings, Bearwood (£11,500); borough engineer. Shops and flats, Bearwood Road; E. Hewitson.

South Chingford (ESSEX).—Re-erection of factory, Hall Lane, for the Langite Cork Manufacturing Co.

Southport.—Opera House and shops (£120,000), Lord Street; G. Tonge, architect.

Staffordshire.—Mental hospital; clerk to the County Mental Hospitals Board.

Stewarton (AYRSHIRE).—Re-erection of hosiery factory for D. Macrae & Sons (£30,000).

Swadlincote (DERBYSHIRE).—Telephone exchange for H.M. Office of Works, King Charles Street, London, S.W.

Thurnham (KENT).—Extensions, Cobham Manor, for Viscount Bearsted.

Twickenham.—Practical instruction centre, Orleans School, for the T.C. (£6,105); R. Cowper & Son, contractors, Halford Road, Richmond, Surrey.

Tynemouth.—Housing scheme (136 acres), Smith's Dock land; borough engineer.

Upholland (LANCS.).—Houses (23) for the U.D.C.; surveyor.

Wallasey.—Houses (106), Moreton estate (£33,942).; Lloyd and Cross, Birkenhead.

Wallsend.—Extension of the Western Schools and Central Schools (£10,000) for the T.C.

Warrington.—Fairclough School (£47,887), for the E.C.

Wealdstone.—Court House (£24,942); G. H. Denne & Son, Ltd., High Holborn, W.C.

Weymouth.—Houses (78), Westham estate, for the T.C.; borough surveyor.

Whitehaven.—School (480 places), The Meadows, for the borough E.C.; T. C. Bone, clerk.

Wigan (LANCS.).—Grammar school extensions for the borough E.C.; A. E. Munby, architect.

Wing (BEDS.).—Houses (30) for the R.D.C.; surveyor.

Wolverhampton.—Re-erection of factory, Stafford Street, for the Elephant Wholesale Cabinet and Upholstery Works Co. (£5,000).

Worcester.—Hospital block, with operating theatres and bed lift, Infirmary (£26,994); T. Broad, Ltd., builders, Great Malvern.

Workington.—Mining school for the Cumberland County E.C.; county architect, Carlisle.

Yeovil.—Houses (80), Cedar Grove estate, for George Wimpey and Co., Ltd., London; A. J. B. Abbott, architect, Commercial Chambers.